POPULAR SCIENCE

MONTHLY

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January

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PAGE 199

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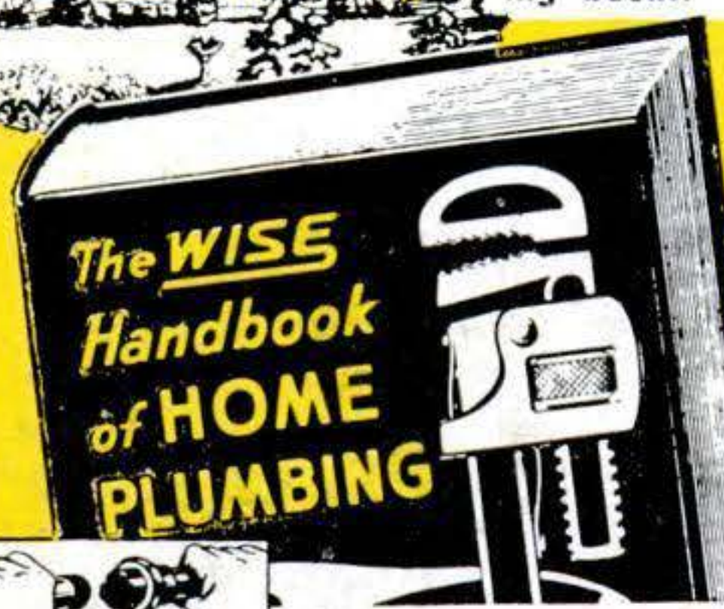

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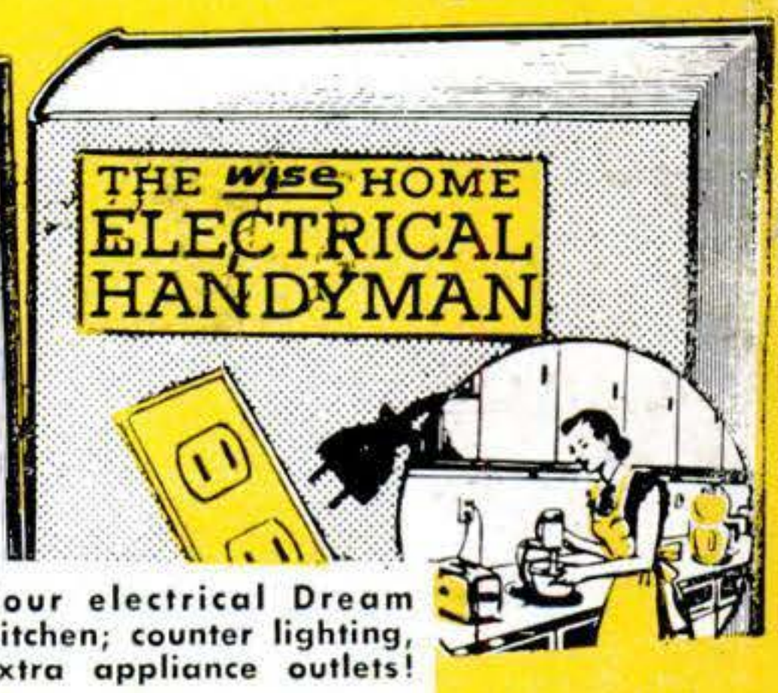

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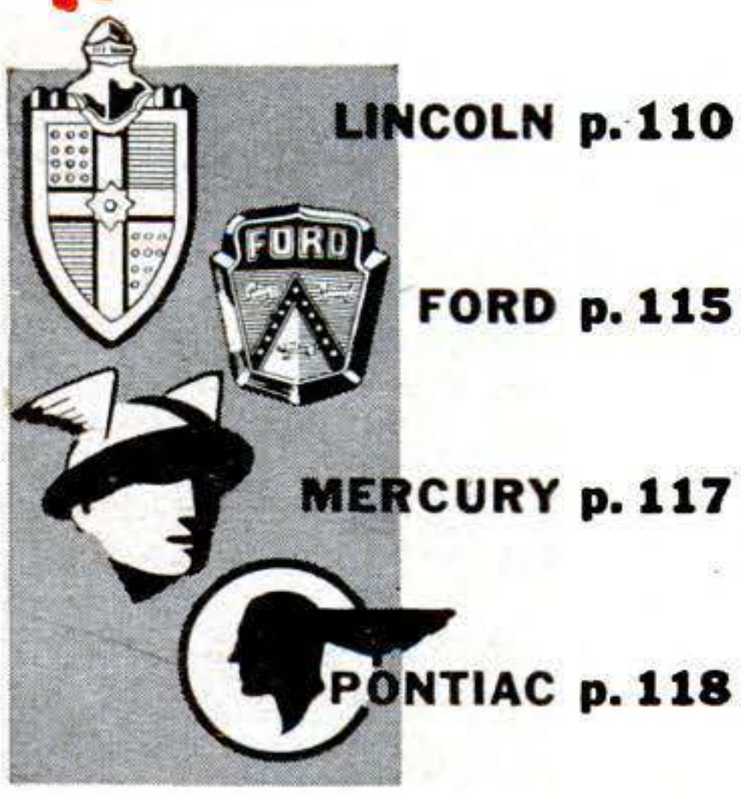
JANUARY, 1953

Here Come the New Cars



***This is the season** when the automobile makers show off their new models. Reports on more of the 1953 cars begin on page 110. Other cars have already been described in our November and December issues. For pictures and full details on those that will be announced during January, see* POPULAR SCIENCE MONTHLY *for February.*

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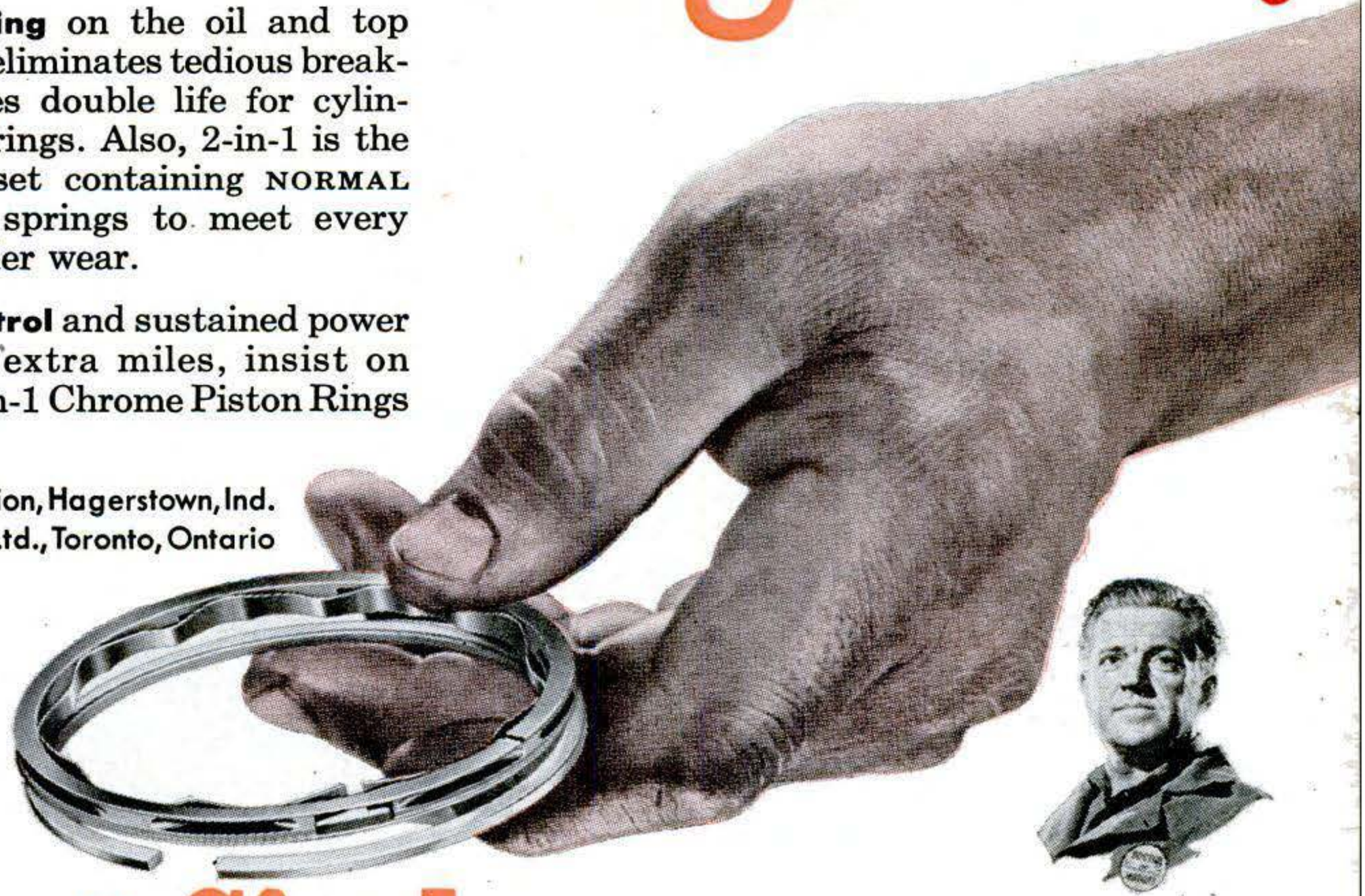

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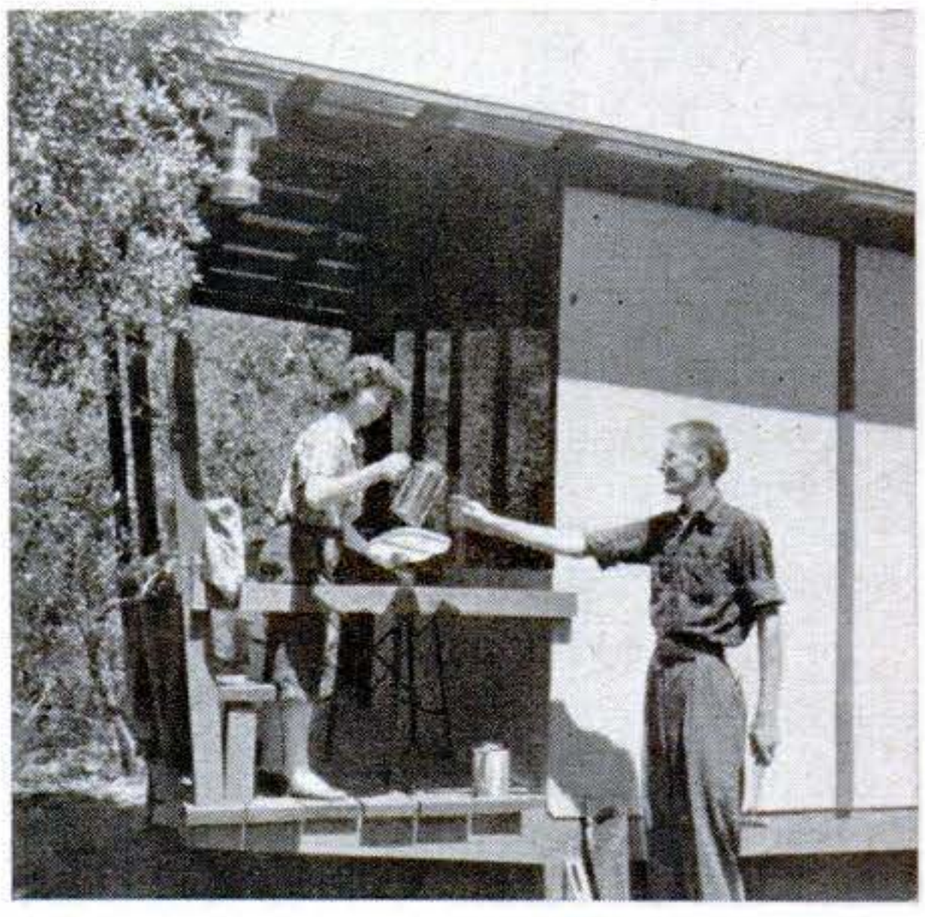
NEXT MONTH . . .

A Vacation Cabin for $200



Looking for a bargain? Then here's one you won't want to miss—a snug cabin for winter week ends or summer vacations—and the cost is only $200 plus a few week ends of work. Complete details on its simplified construction will be given in the next issue of POPULAR SCIENCE MONTHLY.

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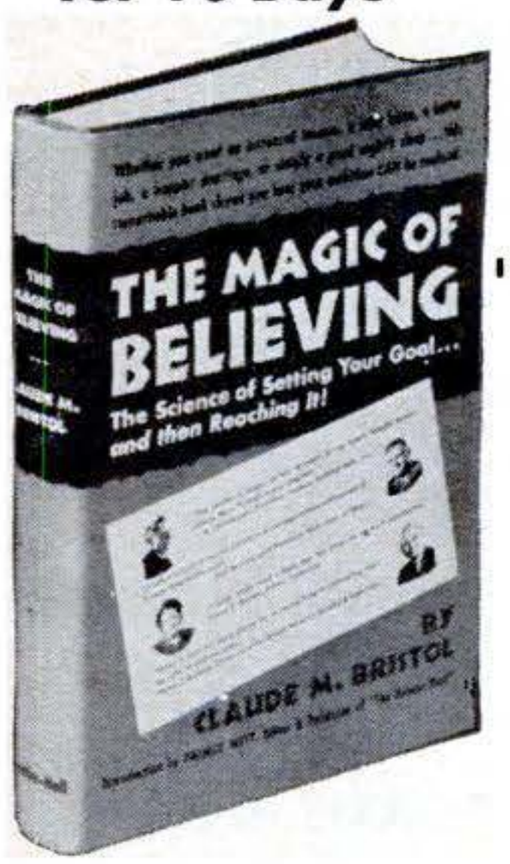

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2. **Sustained concentration is difficult, so use the 3 mechanical devices the book recommends to keep your subconscious constantly reminded of your goal.**
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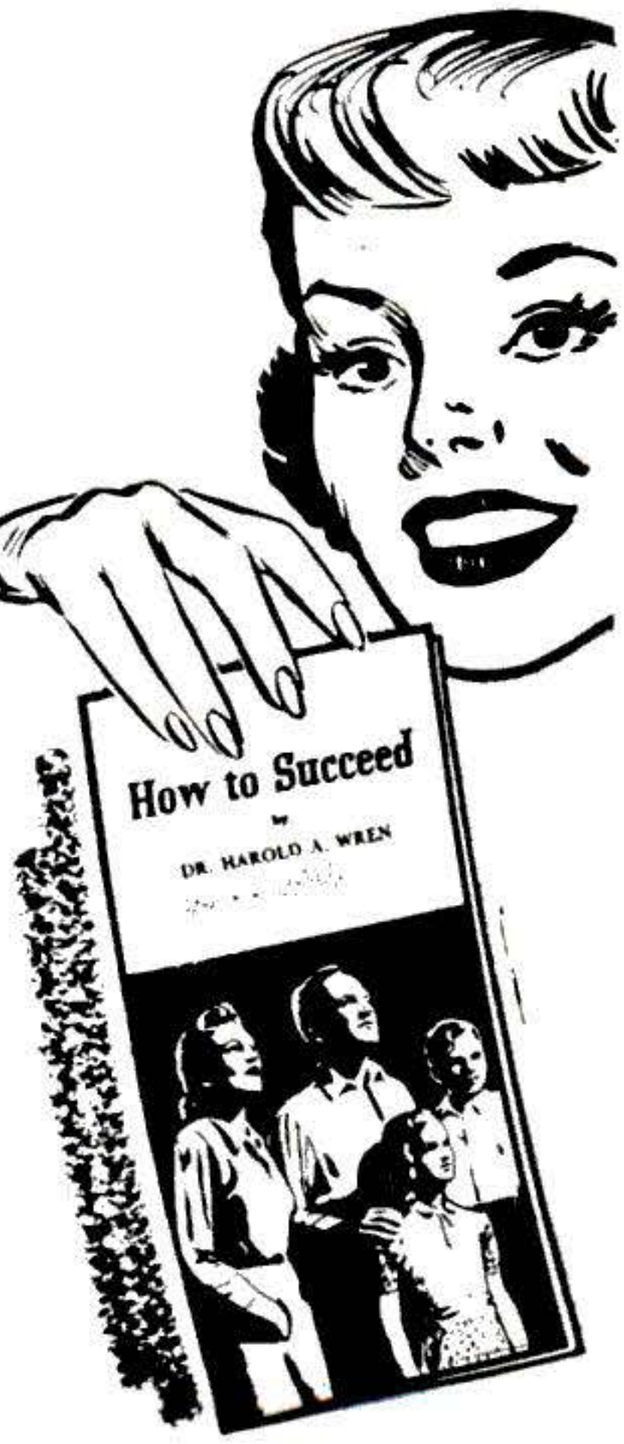

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- ☐ Foremanship
- ☐ Mechanical Drafting
- ☐ Machine Design-Drafting
- ☐ Machine Shop Practice
- ☐ Tool Design
- ☐ Industrial Instrumentation
- ☐ Machine Shop Inspection
- ☐ Reading Blueprints
- ☐ Toolmaking
- ☐ Gas—Electric Welding
- ☐ Heat Treatment—Metallurgy
- ☐ Sheet Metal Work
- ☐ Sheet Metal Pattern Drafting
- ☐ Refrigeration

POWER
- ☐ Combustion Engineering
- ☐ Diesel—Electric
- ☐ Electric Light and Power
- ☐ Stationary Steam Engineering
- ☐ Stationary Fireman

RADIO, TELEVISION, COMMUNICATIONS
- ☐ General Radio
- ☐ Radio Operation
- ☐ Radio Servicing—FM
- ☐ Television
- ☐ Electronics
- ☐ Telephone Work

RAILROAD
- ☐ Locomotive Engineer
- ☐ Diesel Locomotive
- ☐ Air Brakes ☐ Car Inspector
- ☐ Railroad Administration

TEXTILE
- ☐ Textile Engineering
- ☐ Cotton Manufacture
- ☐ Rayon Manufacture
- ☐ Woolen Manufacture
- ☐ Loom Fixing
- ☐ Finishing and Dyeing
- ☐ Textile Designing

HOME ARTS
- ☐ Dressmaking and Designing
- ☐ Cookery
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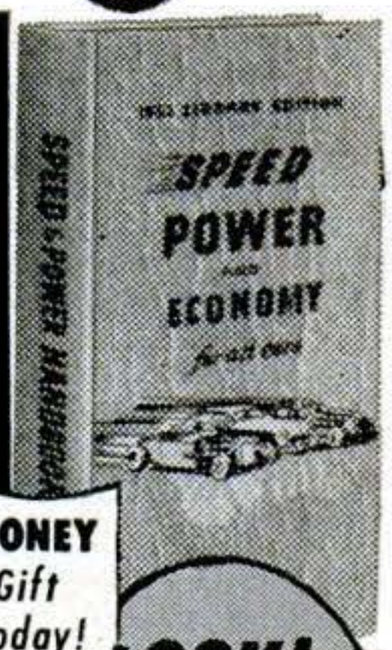

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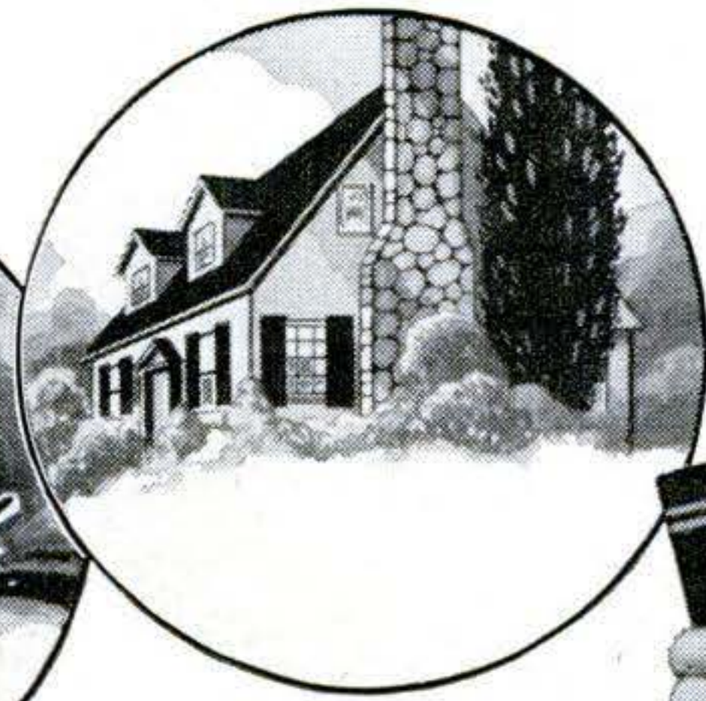

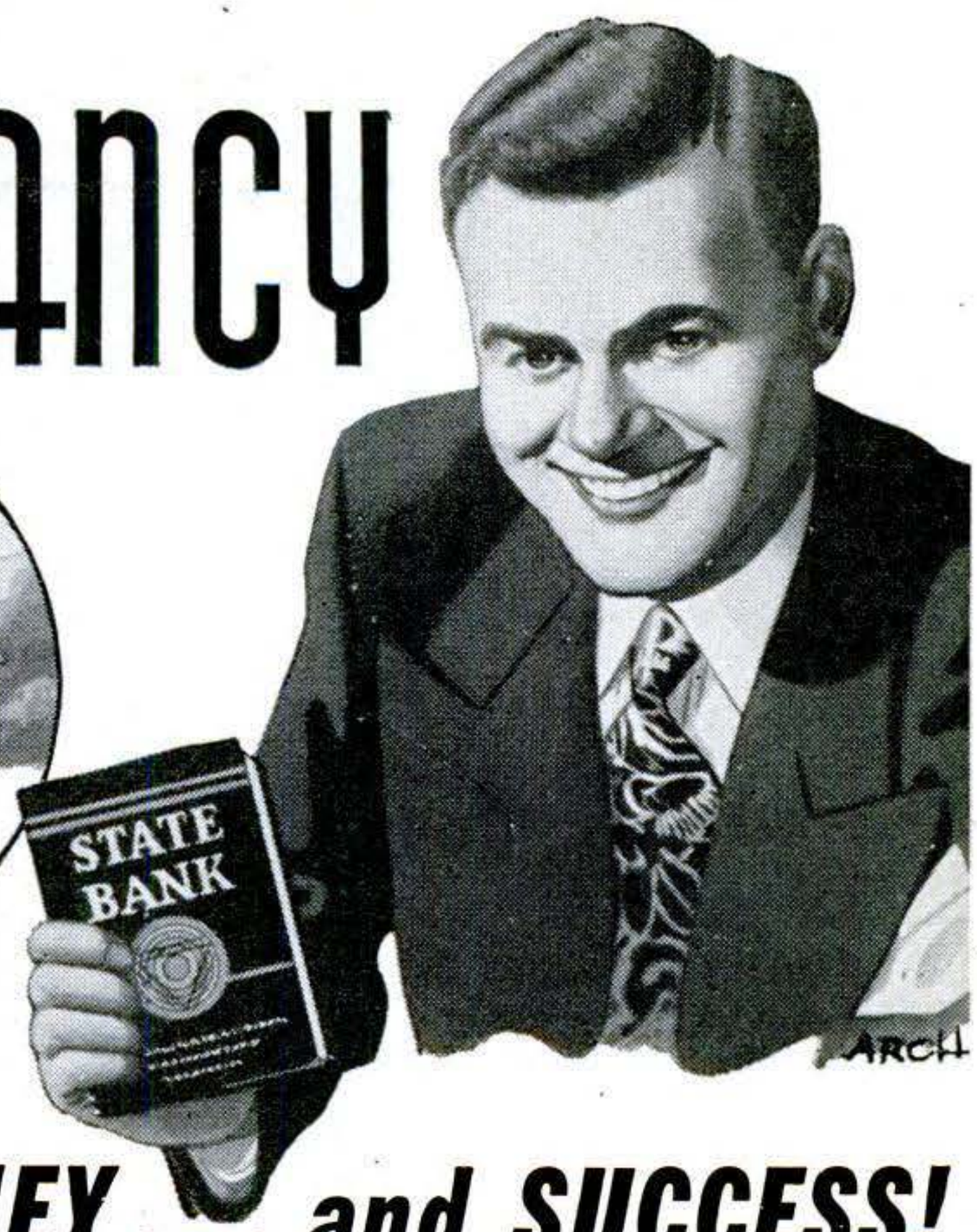

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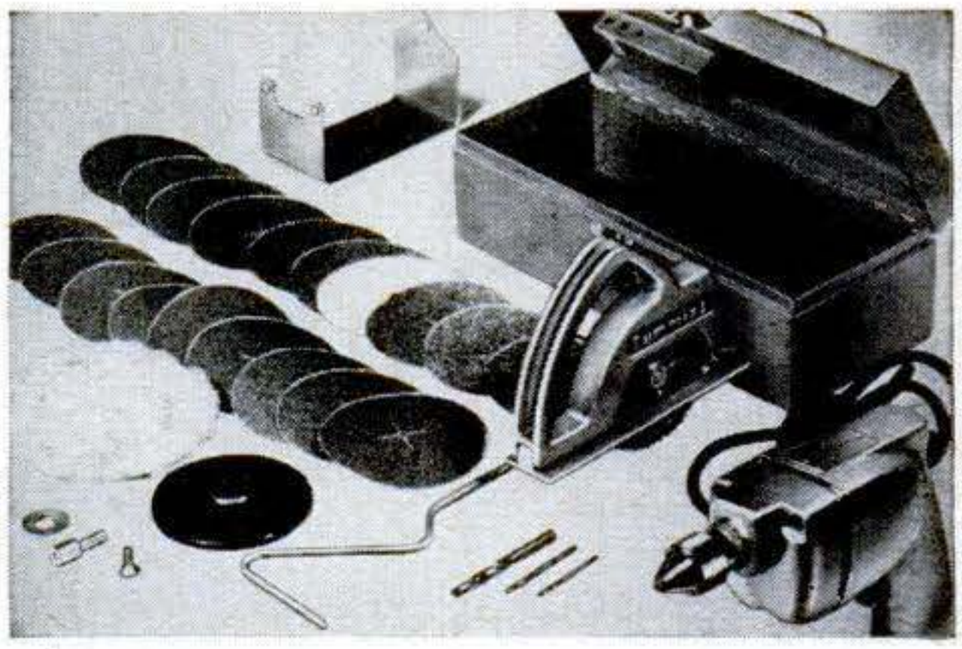

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DOES YOUR TV SET HAVE TO COST YOU FROM $25—$90 A YEAR FOR REPAIRS?

Not if you know a few simple things about your television set . . . not if you know when you really need a serviceman . . .

and when your trouble can be corrected with a minor, simple, safe adjustment you can make yourself . . .

You've seen a serviceman come in to work on your set. He taps this and twists that. Then he either replaces a tube, or makes an adjustment on a part. All he has to do is recognize and locate the trouble, and then make the correction.

You don't have to be a mechanical genius to be able to make many of these same adjustments on your set yourself. If you have ever put a new washer on your water faucet, or changed a tire on your automobile, or attached a new plug to an electric cord—you have enough "mechanical background" to be able to take care of all "nuisance repairs" yourself, and probably of most other things that go wrong with a set.

Amazing New TV Owner's Self Repair Book Takes the Mystery Out of TV Repairs

With the amazing new TV Owner's Self Repair Book, you can have a television expert at your side whenever you need it. Now, every time your set begins to flicker or jump, or becomes distorted or dissolved into lines or zags—a flick of the finger to the right page **SHOWS YOU EXACTLY WHAT CONTROL** knob to turn to correct the trouble in less than one minute! From now on, every time you're annoyed by "ghosts," snow or weak channel reception—the TV Owner's Self Repair Book shows you how to effect a quick 15-minute repair job that eliminates these faults and restores the set to perfect, movie-clear reception.

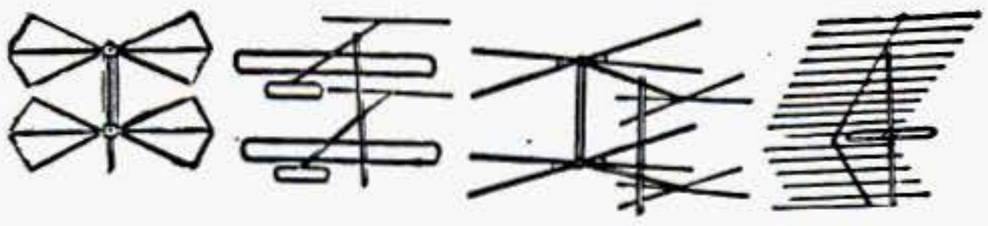
IT HAS BEEN PROVEN THAT 1 OUT OF EVERY 3 TV FAULTS IS CAUSED BY A WEAK OR BURNT OUT TUBE. Just by replacing a tube you can correct fully 33⅓% of the troubles that may develop in a set. The TV Owner's Self Repair Book shows you how to safely locate and change the bad tube in less than 5 minutes.

Contains special tube diagrams that spot faulty tubes immediately . . . a complete section on antennas . . . interference . . . covers T.V. set models from 1947-1952 . . . all makes . . . all sizes.

When you check your trouble and find that it is due to a faulty tube, you are led right to it. You simply find the diagram for your set and the one (or more) tubes you are to check—and **THE ONE TO REPLACE** are pinpointed for you! You are directed right to it. No blind guessing or hunting for the bad tube. **ONLY IN THIS BOOK,** has there been developed a special identification method to make it a cinch to locate the bad tube. Each tube in each diagram not only carries its usual trade identification number, but also a special letter to identify its function and location as well. It's (1) find the trouble, (2) find the tube, bingo, (3) replace the tube—and that's all there is to it!

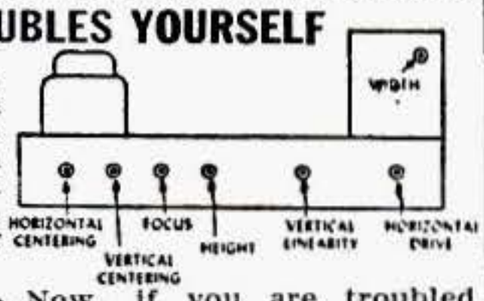
Which Type of Antenna Is Best for Your Set

The special chapter on antennas explains what an antenna is supposed to do; the reason for the different shapes and arrangements; the reason for "stacking" and multiple antennas; how to "orient" an antenna for best reception; the need and use of a "rotator"; the special antennas for "fringe" areas; how to install, change or add antennas and parts; information on complete antenna installation kits which are available. Just about everything practical that you need to know about antennas.



Do This Right Now and Prove You Can FIX TV TROUBLES YOURSELF

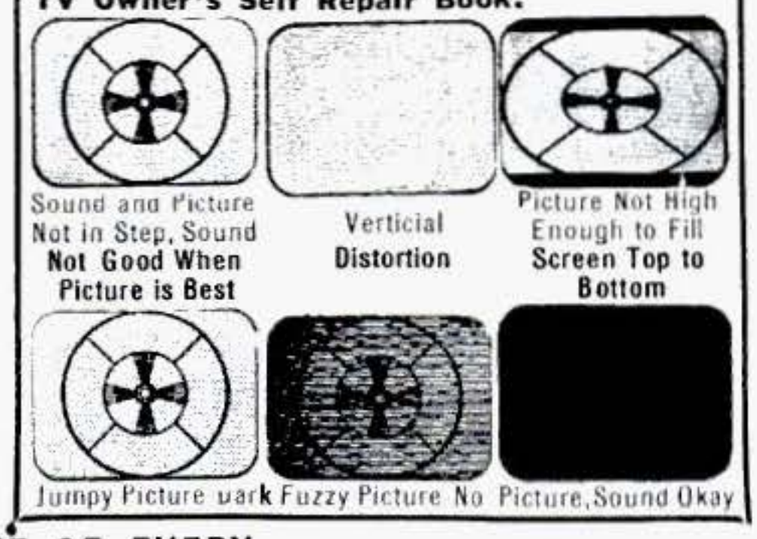
Turn your set around. You will find in the back of it an arrangement of "rear controls" looking like this:



Zags on Your Screen

Now, if you are troubled with these zags on your screen, locate Hor. Syn. on the above rear panel. Turn control slowly to left. Zags will disappear and you will have a perfect picture on your screen. That's all there is to it. You have made a $5 repair in less than 5 minutes.

A few other repairs that you can make yourself without tools, without any special knowledge, just with the help of this new TV Owner's Self Repair Book.

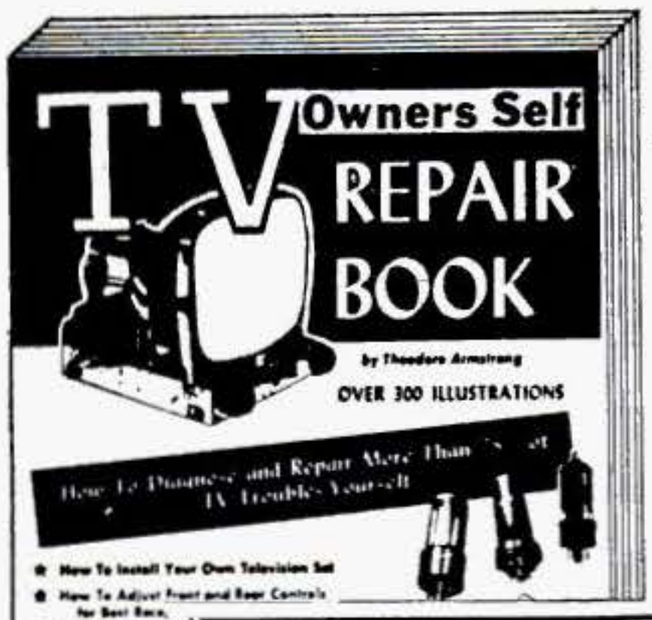


6 Easy Ways to Eliminate interference

In the TV Owner's Self Repair Book there is a unique chapter devoted just to elimination of interference. This chapter tells you just what "interference" actually is. It describes and illustrates the interference symptoms or patterns which appear on your screen in the form of diagonal lines, vertical lines, herringbone or hyphens all over the screen, etc. **This chapter gives you the easy ways to eliminate interference, doing it yourself in a few minutes.**

Complete Price Lists of All Tubes

The TV Owner's Self Repair Book contains a full listing of every tube used in TV sets, fully identified with number, and also listing of picture tubes and with the fair retail prices (by the way, prices range from $1.10 for a 5YEGT tube to **$6.60** for a 6CDG tube and up to $101.00 for a 24 inch picture tube, 24BF4). A full listing, also, of standard and reasonable charges for every type of television service and repair job. No longer need you be in the dark when it comes to knowing what a job should cost. Now you can make your own minor repairs and in addition know just how expensive "Expensive" repairs should really be.



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Unconditional Money Back Guarantee!

Let us send you a copy of this TV Owner's Self Repair Book. Look at it, go through it, read the general information it offers on how a TV set works. Use it to adjust the controls on your set to 100% perfection. Use it, above all, in making your next "fix-it" job on your set. Then—if you don't think that it is the best book of its kind on the market, that it will save you up to a possible $300 on repairs and adjustments on your set during its life, return it to us. We'll promptly send your money back. You must be satisfied 100% or it costs you nothing to examine and try the book—in your home on your set. What could be fairer? But send for the book now and enjoy the best television reception from your set right away!

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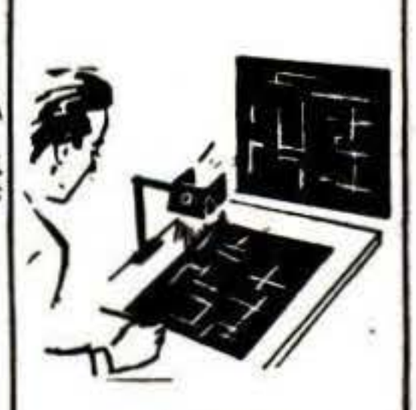

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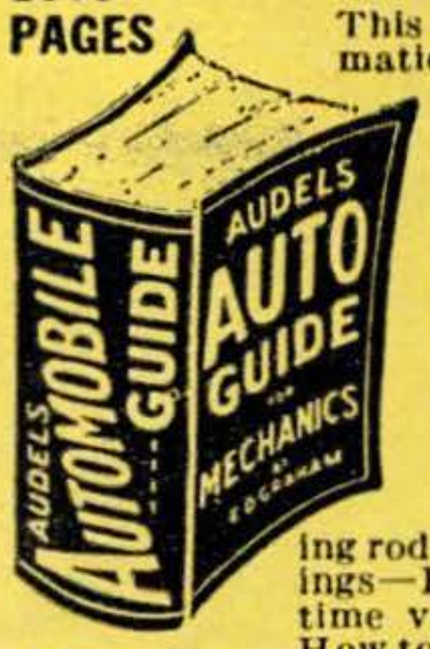

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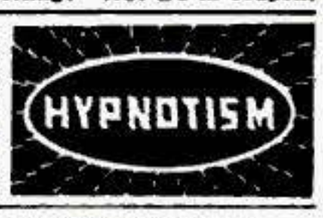

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Letters—

Nonstop Driver Reports

I was extremely pleased by your careful report on our coast-to-coast nonstop run [PS, Nov. '52, p. 174]. Our only troubles were a burned-out coil and condenser and defective fuel pumps. We simply switched to the emergency units and kept rolling.

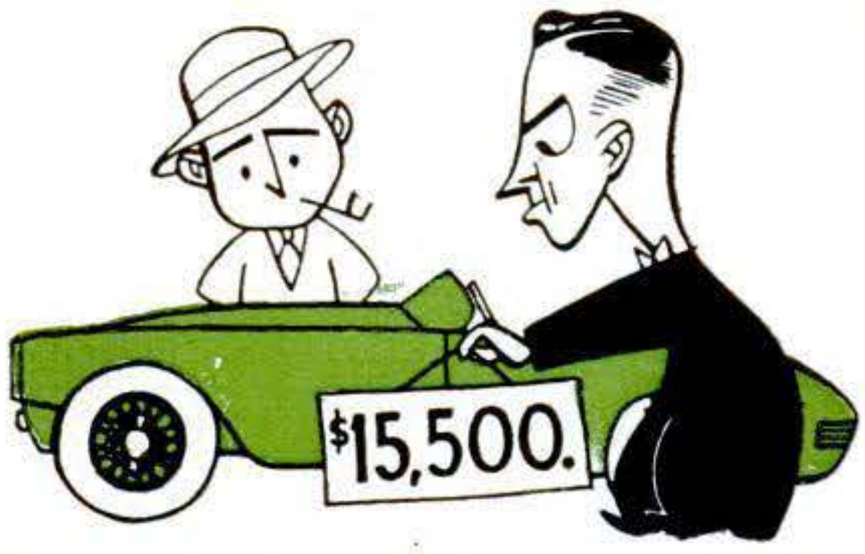
Police escorts usually wanted to take us through their towns at 60 m.p.h., but we flagged them down, explaining we were on an endurance run, not a speed test. We cooked some food in the car, and ordered the rest by radiophone from restaurants ahead. It was delivered by obliging police cars.

People turned out to watch us everywhere, and many cars followed us from one town to another. Next year I plan a 14,000-mile nonstop trip from Mexico City to Alaska.

LOUIS MATTAR, San Diego.

$13,000 Ferrari Is Too Cheap

As Western representative for Ferrari, I was embarrassed by an erroneous price of $13,000 quoted for the Le Mans Ferrari in your August issue [p. 74]. As soon as the



article appeared, I received a call from a potential customer in San Francisco who said my price of $15,500 f.o.b. New York was far in excess of the advertised price . . .

GEORGE JOSEPH Jr., Denver, Colo.

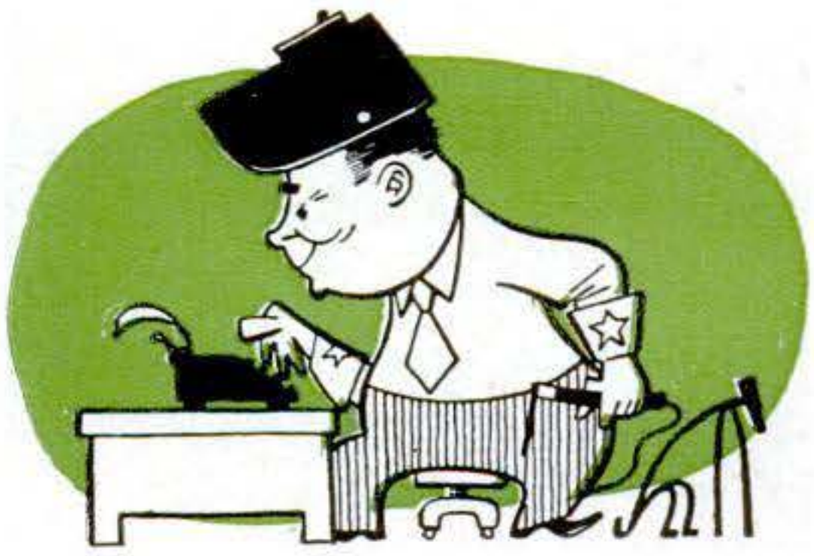
Our apologies to Mr. Joseph. The PSM reporter (himself the proud owner of a '49 Plymouth) was so awestruck by what he understood to be the correct price of $13,000 that it never occurred to him he could have got it too low.

Incidentally, in the same issue we ran a story about the Rolls-Royce Silver Dawn explaining why it cost $10,000. This presents an interesting comparison: the $15,500 Ferrari develops 250 horsepower and tips the scale at 1,847 pounds; the $10,000 Rolls puts out about 125 horsepower and weighs in at 4,200. Thus the Italian speedster costs $8.39 per pound vs. the Rolls' $2.38. However, if it's horses you're after, the Rolls sets you back $80 per horsepower, the Ferrari only $62 . . . Just can't make up our mind which automobile is the thriftier buy.

He Can Weld, Too

How about some more articles like "How I Learned Arc Welding" [Sept., p. 202] by Harry Walton. He sure can write.

R. NUNEZ, Havana, Cuba.



For another article by Harry Walton, senior editor of PSM's Mechanics & Handicraft section, see page 190.

Build a Better Trap

We sincerely appreciate the mention in P.S. News and Notes [Sept. '52, p. 162] about the reward we are offering for a "humane" small-animal trap. We have received several inquiries as a result.

LESTER A. GILES Jr.
The American Humane Association
Albany, N. Y.

Is Everest Still Climbing?

How did the author of "Will They Ever Climb Mt. Everest?" [Oct. '52, p. 118] arrive at the figure of 29,002 feet for the mountain's height? I have heard this figure ridiculed.

WILLARD ALLPHIN, Danvers, Mass.

You are perfectly right that the figure of 29,002 feet has been questioned. It was the first estimate of the mountain's height. A

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If you believe that you have an invention, you should find out how to protect it. The first step is to have a search made of the prior pertinent U. S. patents. If a report on this search indicates that the invention appears patentable you can apply for a patent, and the specifications and claims should be prepared.

The firm of McMorrow, Berman & Davidson, with offices in Washington, D. C., is qualified to take the necessary steps for you. We can make a preliminary search on your invention, advise you whether we think it can be patented, and prepare your application for patent.

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later trigonometric computation placed the height at 29,141 feet. However, the figure 29,002 is the official estimate of the Survey of India and is generally accepted by most writers.

Some geographers say the Himalayas, a young mountain range, are constantly pushing upward and both figures conceivably were correct at different times.

Paper Money in Different Sizes

A letter in your August issue [p. 12] suggested that different-colored money be used to avoid mistakes in handing out different bills. I think this is a good idea, but if bills

were made in different *sizes*, it would be impossible for even a blind man to give out the wrong one.

PFC. WILLIAM R. MAURATH,
U.S. Army, Tokyo.

Friction Does It

Referring to your answer to Jim McNabb's note about automatic-transmission cars being barred from Mt. Washington [Sept. '52, p. 12], you state that "some—makes unspecified—do not have enough compression drag for the descent." I believe it is a mistake to call it "compression drag" for it is vacuum that holds the engine and car in going downhill.

ROBERT T. JONES, Arlington, Ariz.

Theoretically, you may be slightly correct. But actually, according to a GM engineer to whom we put the question, it is neither compression drag nor vacuum that contributes most of the retarding effect that can be obtained from an engine. Engine friction tests conducted by GM show that approximately 95 percent of the retarding effect is created by engine friction. So engine friction drag seems to be the best designation. The engineer notes that you have a point in that the high vacuum created when the throttle is closed may have a slightly greater retarding effect on the pistons than the air that is compressed.

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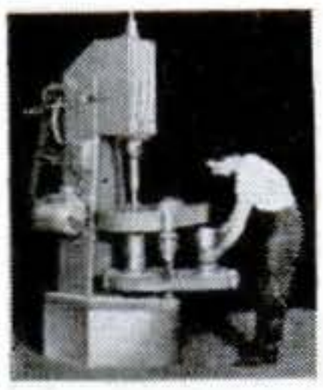

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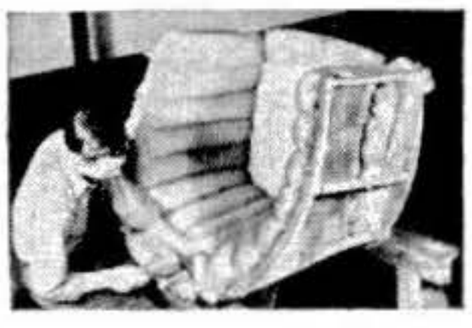

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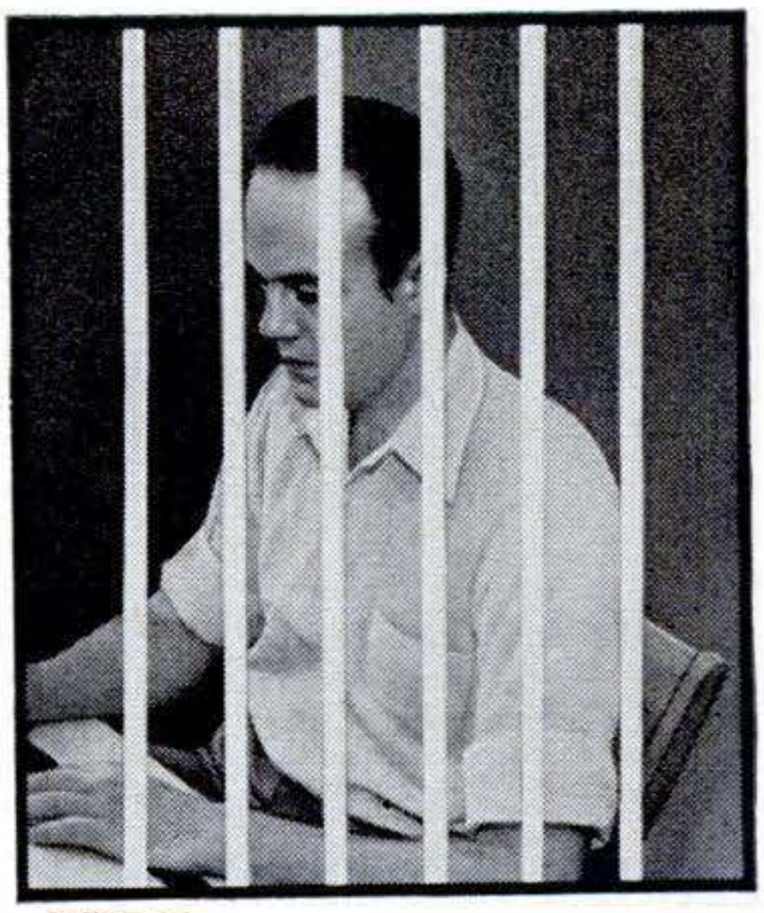

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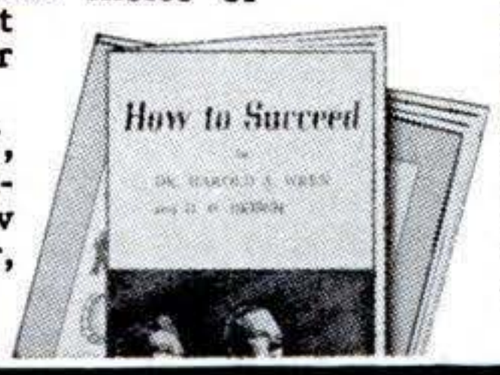

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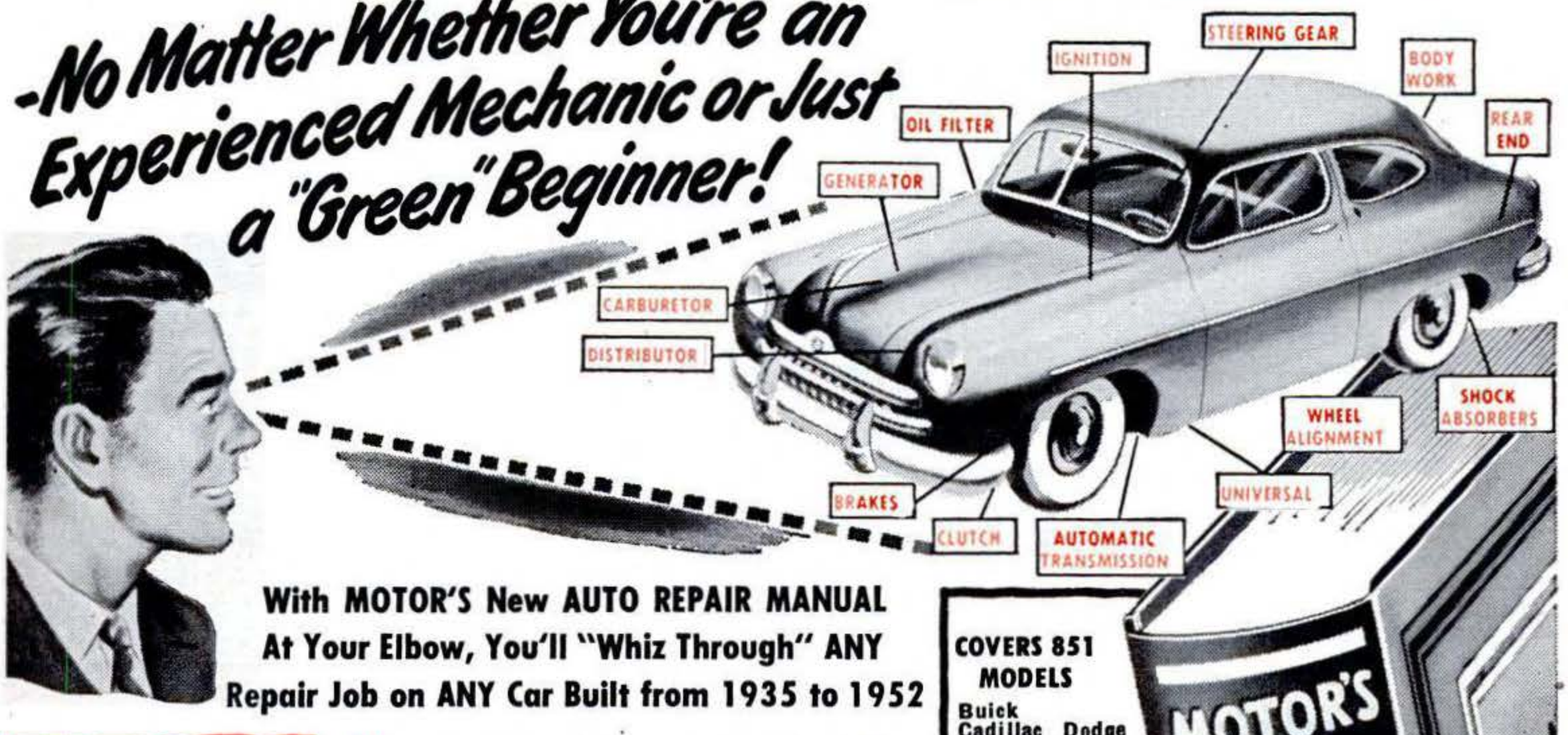

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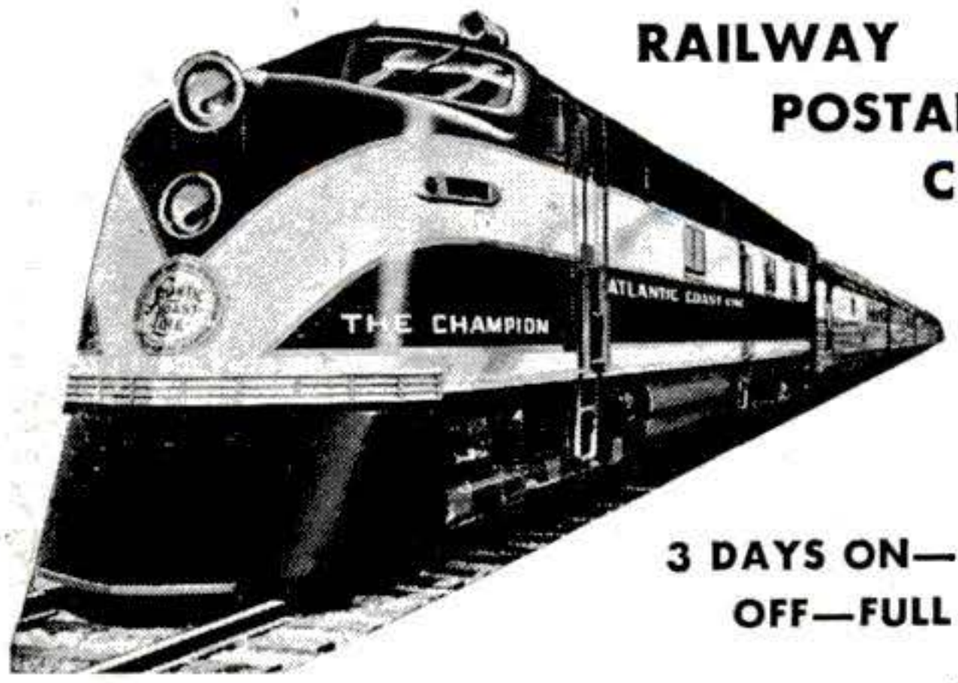

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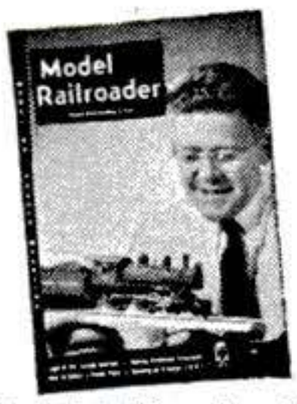

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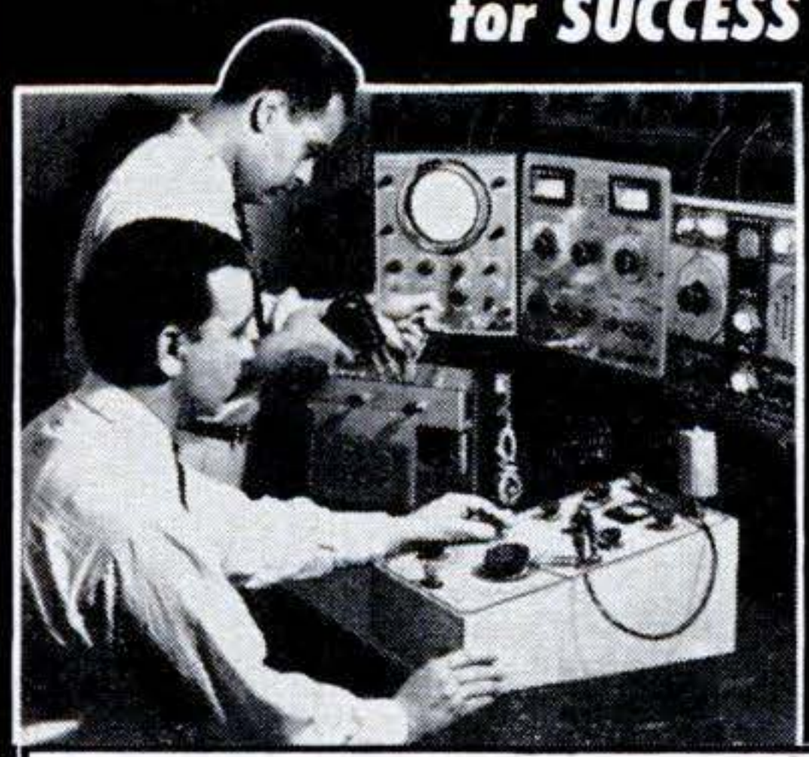

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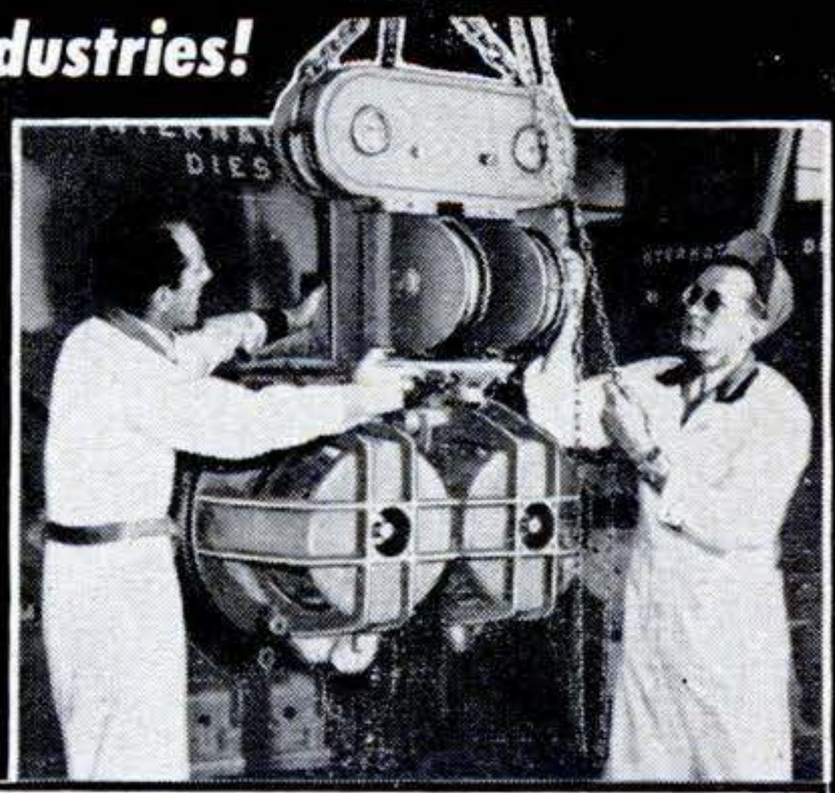

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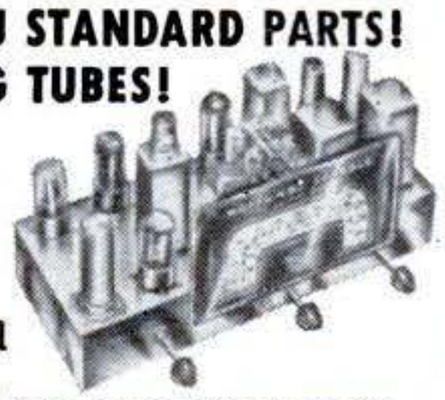

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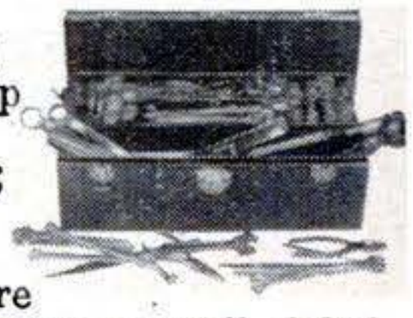

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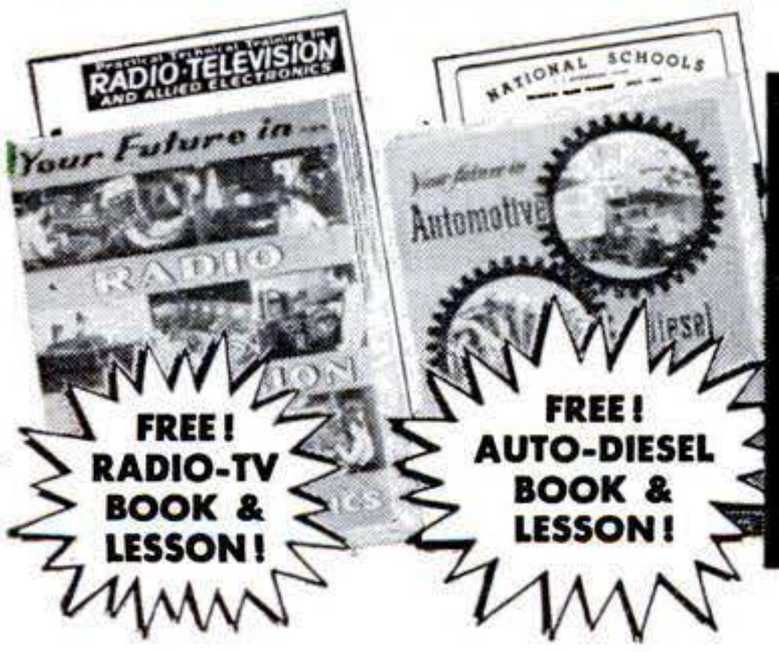

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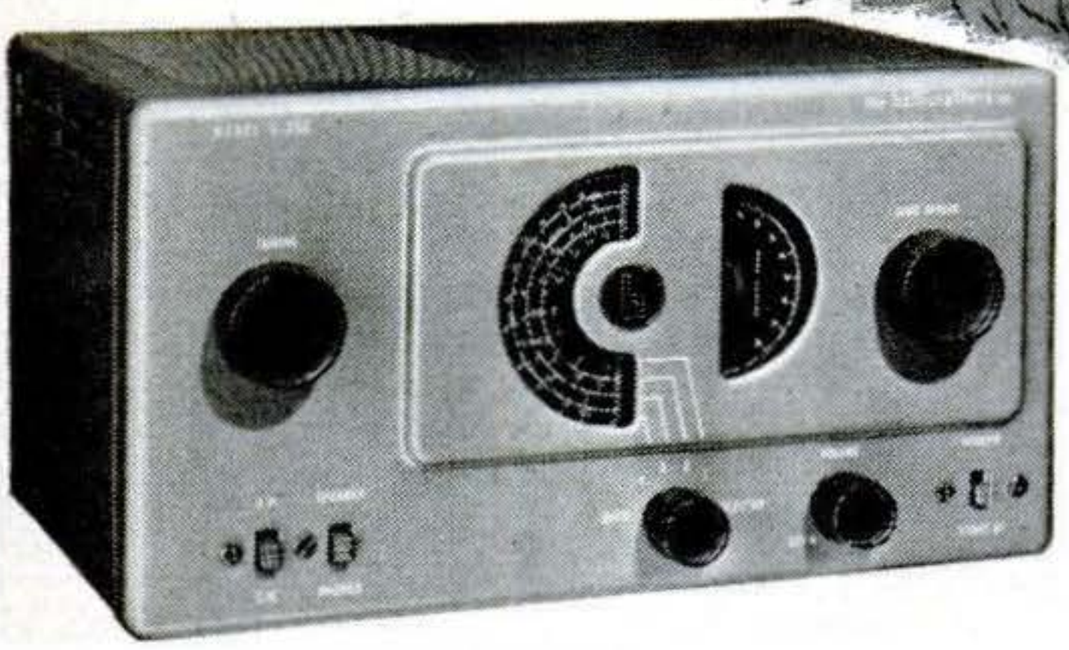

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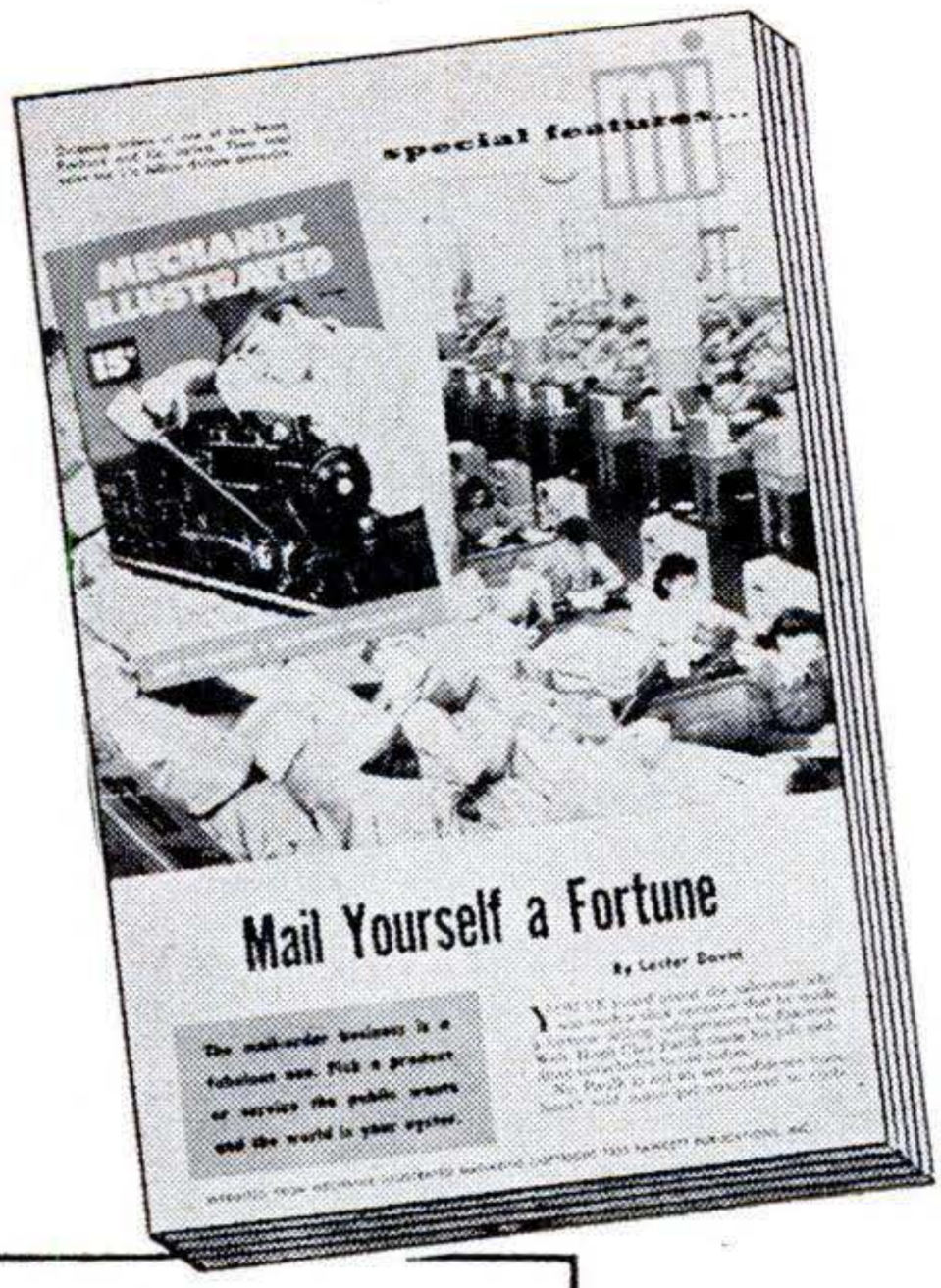

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GAINES. I personally guided his start when he invented an automatic pants presser. He started with one little ad in one magazine. Four years later he retired — with enough real estate to keep him in cash income the rest of his life.

VAN MARK. I worked with him for six years. I met him when he was a wagon man for a tea and coffee house, knocking on doors. He went into Mail Order on nothing—made money from the start —ended up six years later with savings of $50,000 and an income of $5000.00 a year for life without further work.

DUGGAN. A few years ago he was a truck driver. Started fooling with Mail Order in a spare room in his spare time. Last year he said, "I don't know how much I'm worth—after you get the first million you quit keeping track."

MRS. NIXON. Started a small Mail Order business at home—just to keep occupied. It looked good and she came to me for advice. I showed her how to expand. In two years the business got so big her husband resigned his job to help manage it.

FOXMAN. Foxman worked as a hack writer at $70 a week. He had idle time in the evenings—ran an ad offering something he didn't have—got so many orders he had to find a source of supply. He made $18,000 the first year. He gives me credit for "showing the way."

JORGENSON. Consulted me about a specialty product. On my advice he ran one ad to "test" its saleability. That ad brought sales of $50,000. In his first year he did a business of nearly a half million dollars. His original investment was less than a thousand.

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Glance at the examples at left. *These true stories are far from unusual.* Multiply them by the hundreds and you begin to get an idea of what can be done . . . what *is* being done...in the phenomenal Mail Order field.

* * *

Yet, if you were to jump blindly into Mail Order your chances would be slim. A peculiar brand of "know-how" is vital in this little - known, little - understood business. *This is fortunate for you.* If any Tom, Dick, or Harry would "click" in Mail Order, the field would have been overloaded years ago.

But now you have the opportunity to learn the authentic secrets of successful Mail Order operation. They are revealed for the first time, step by step, in an extraordinary new Survey . . . *the L.W. Confidential Mail Order Letters.*

This Survey is not a course—not a book —not a group of lessons. It is a simple guide that anyone can follow. It shows you how to pick the right product for Mail Order. It shows you exactly how to start a profitable business *fast*, with cash or Money Orders in the envelopes you receive. It shows how to buy your product out of the very money you get in the mail, so you don't have to tie up cash in large supplies of your product. It gives you actual examples of ads and letters, *analyzed to show how and why they make money.* It demonstrates the months to start, the time to expand, the best way to get prospects' names. It reveals from A to Z the confidential facts that have made fortunes for Mail Order operators who use them.

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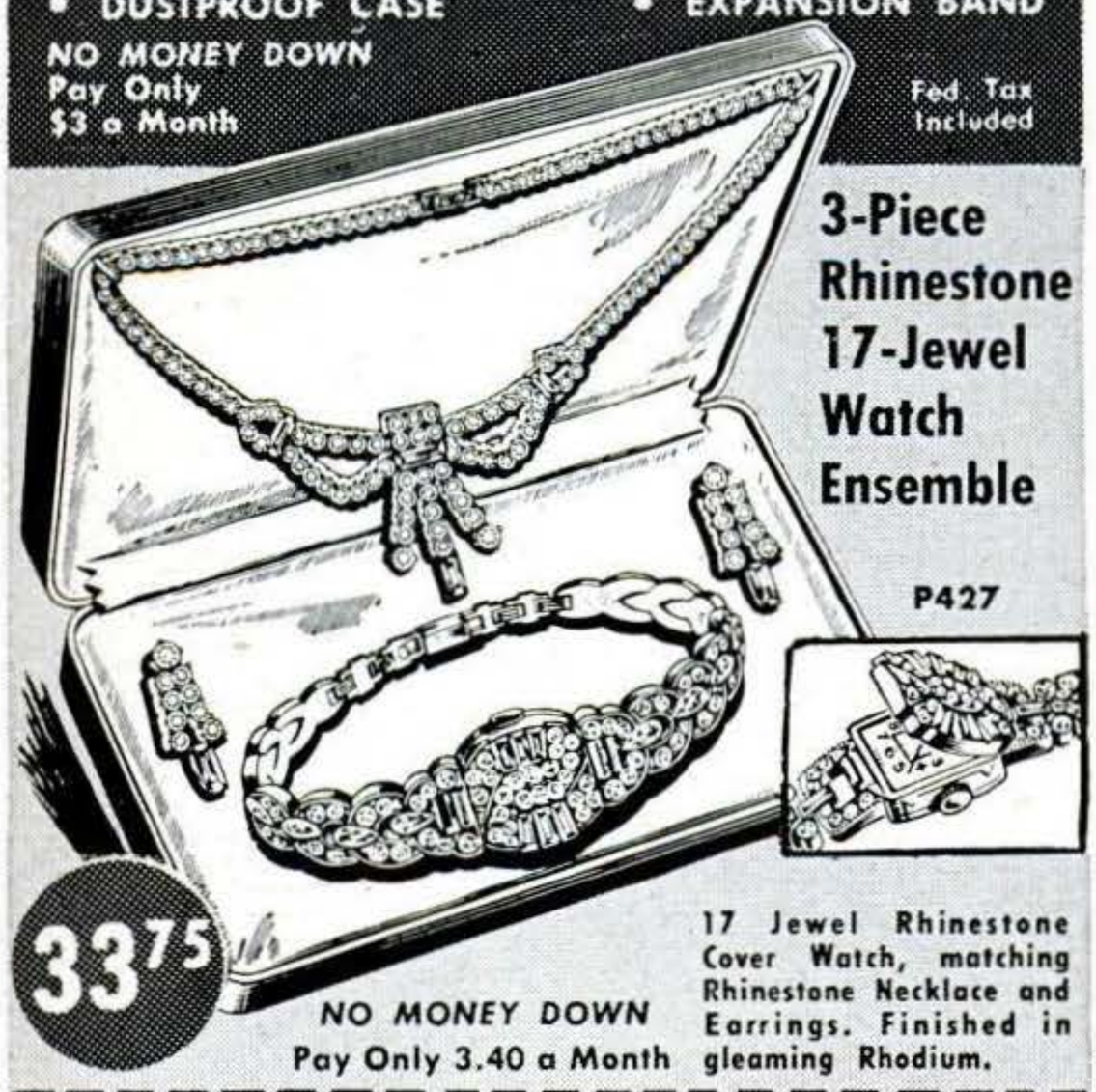

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700-16(6)	8.72	760-15	5.92	750-17	11.52	900-20	17.22
750-16	7.02	800-15	6.62	700-18	15.82	1000-20	18.52
525-18	4.92	820-15	6.72	600-20	8.72	1100-20	18.52
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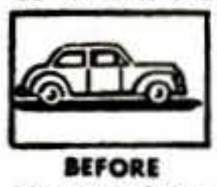

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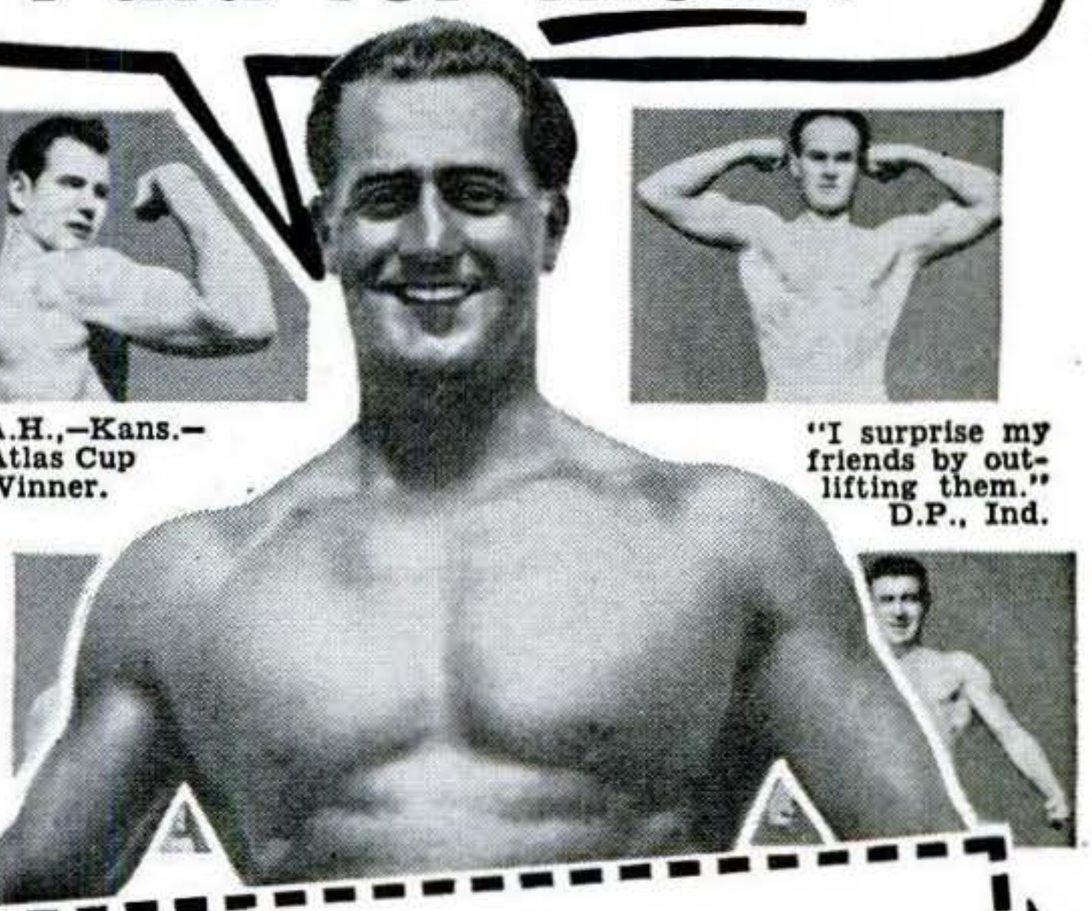

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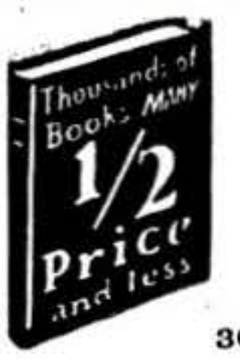

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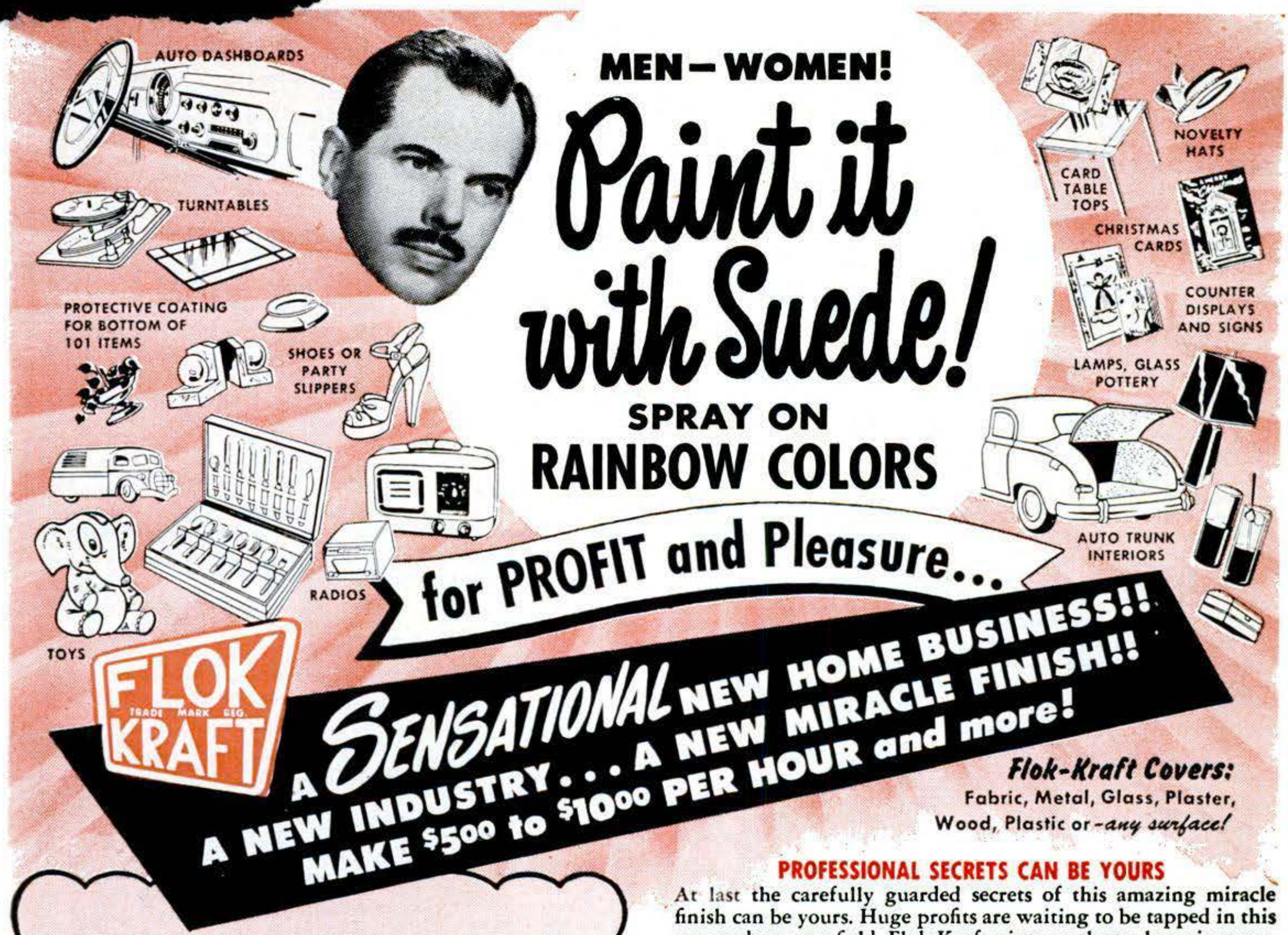

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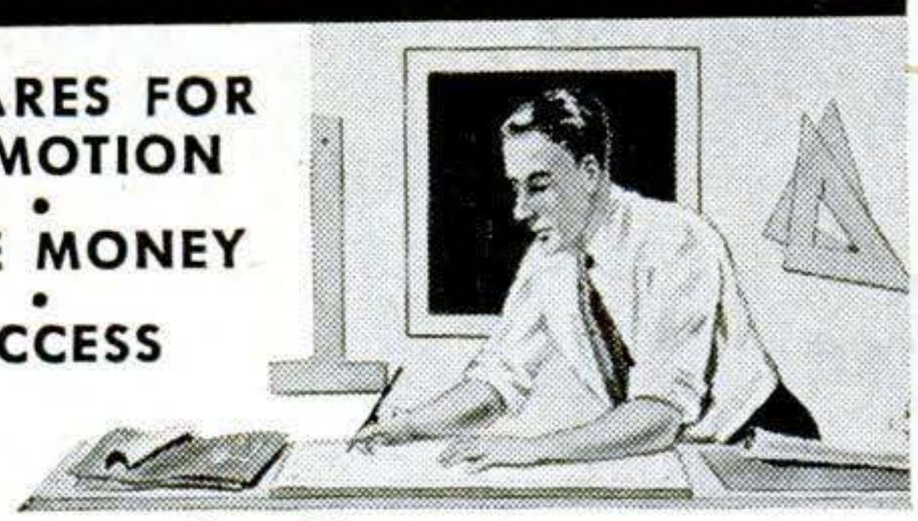

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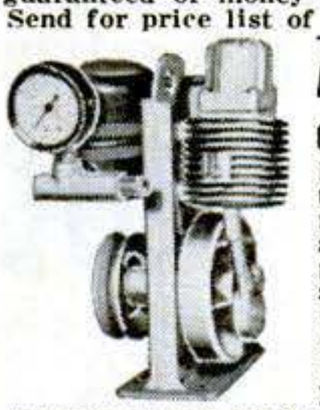

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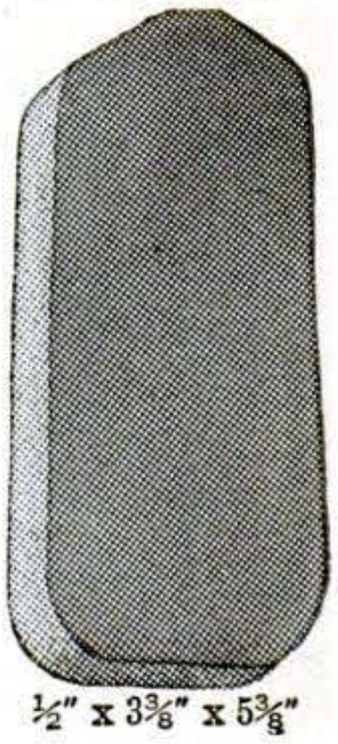

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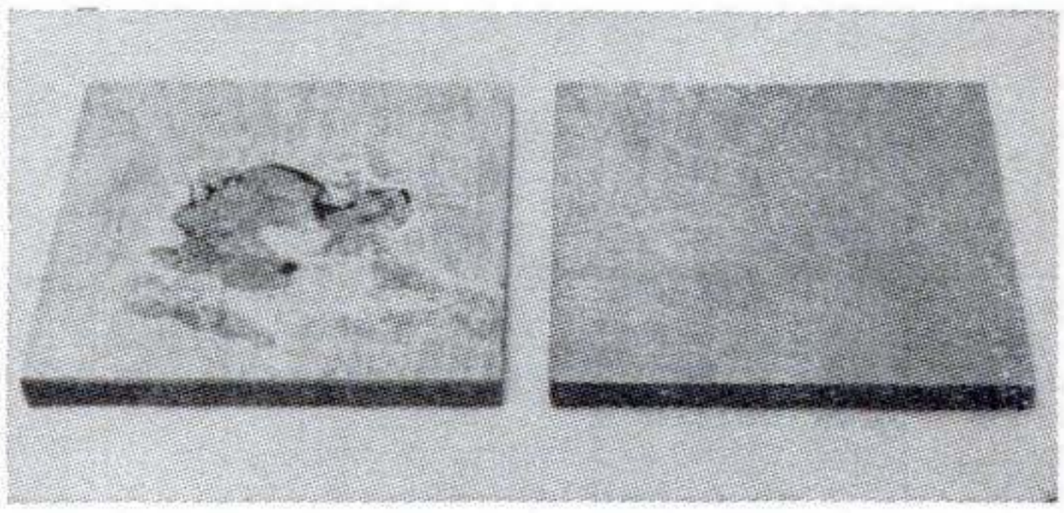

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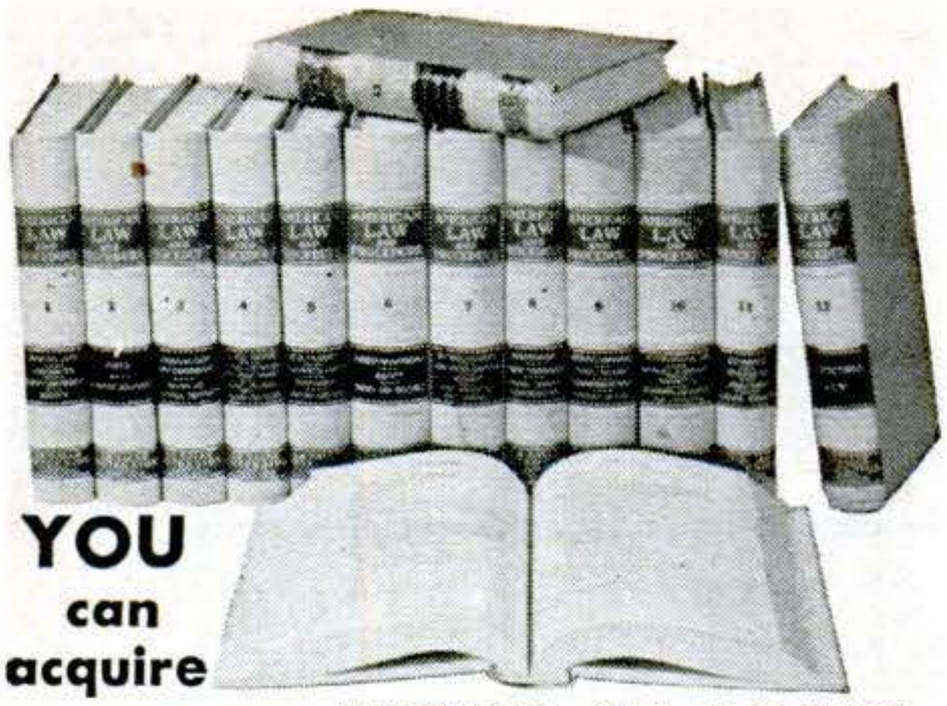

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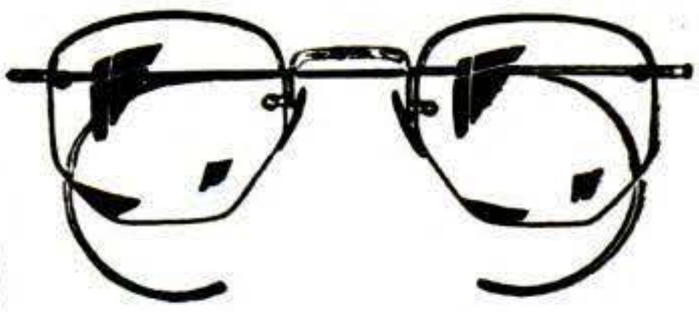

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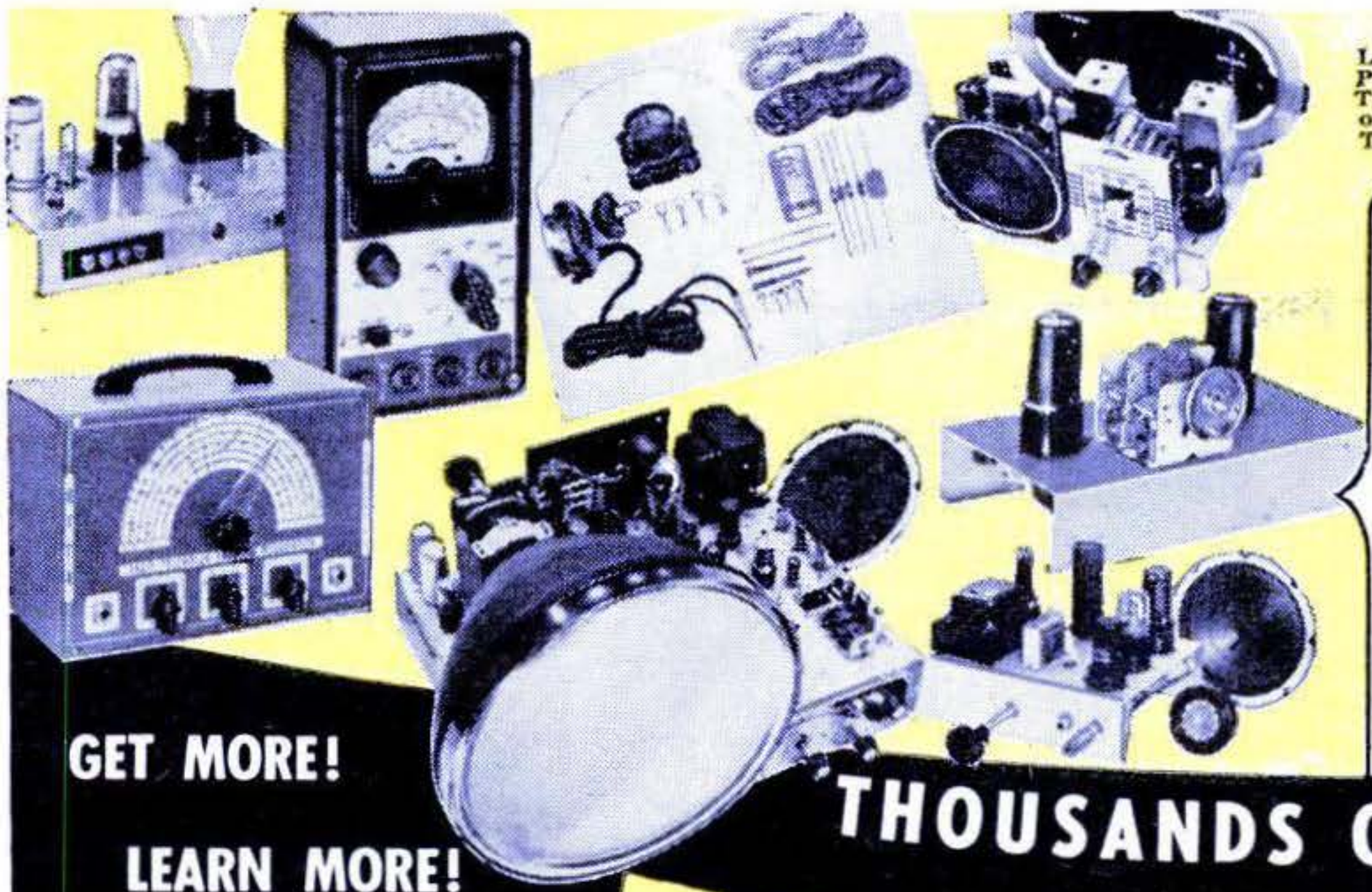

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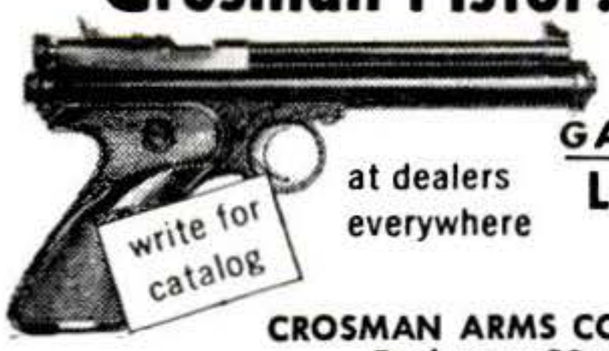

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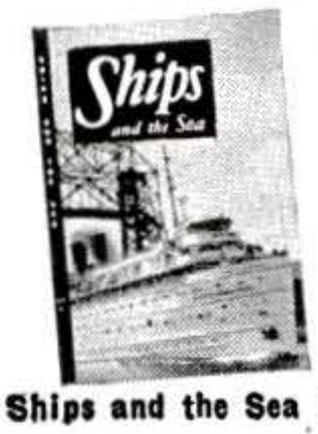

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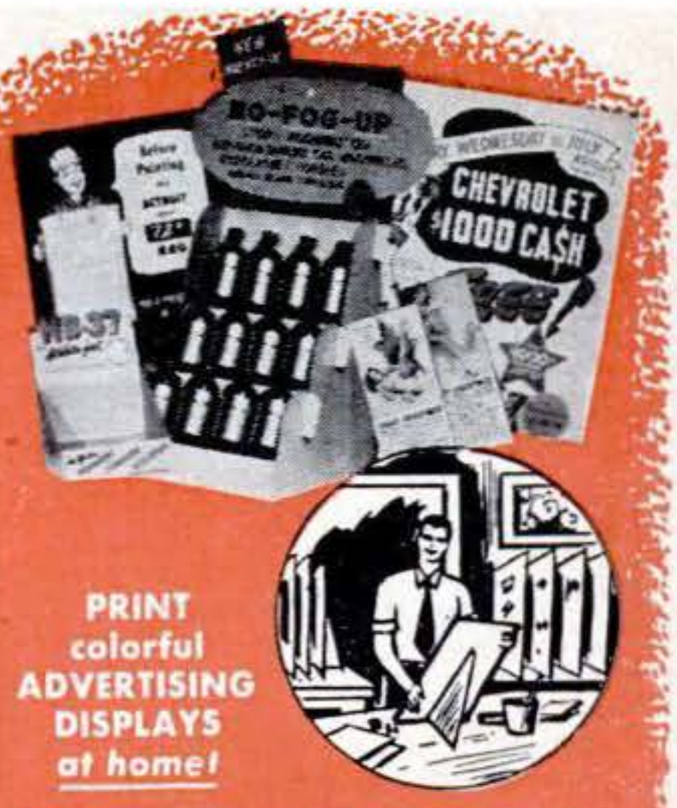

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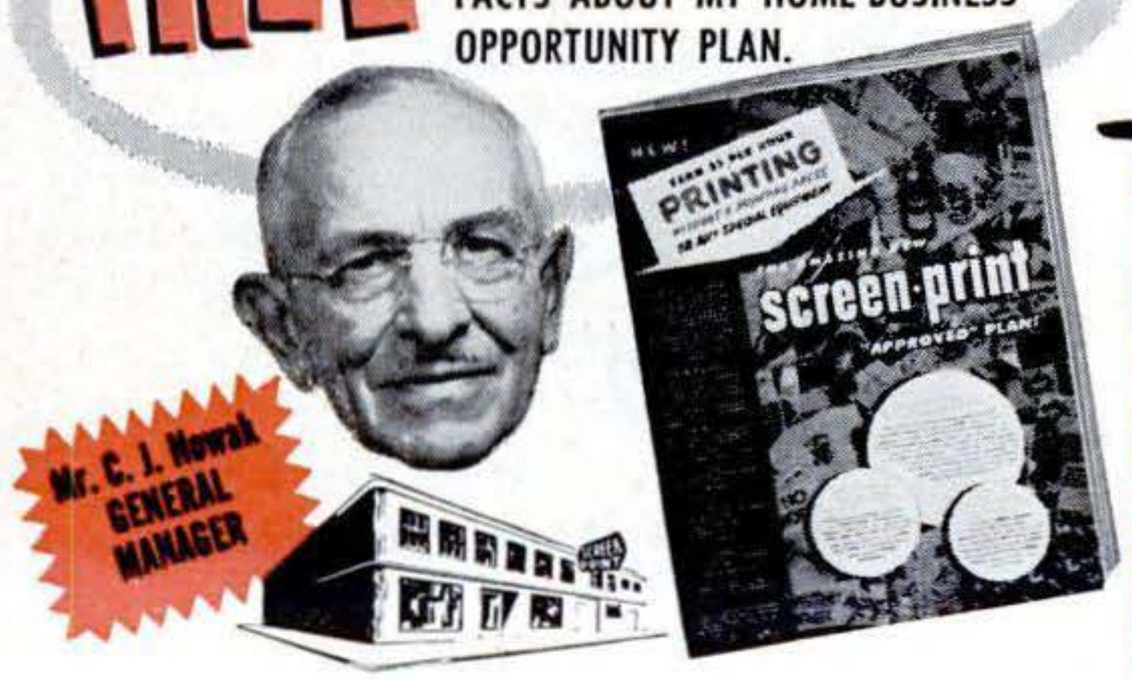

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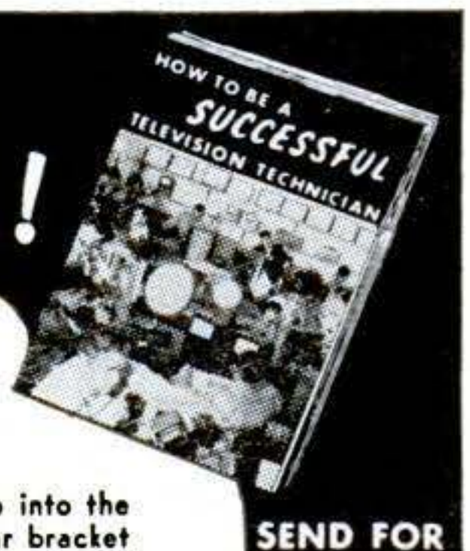

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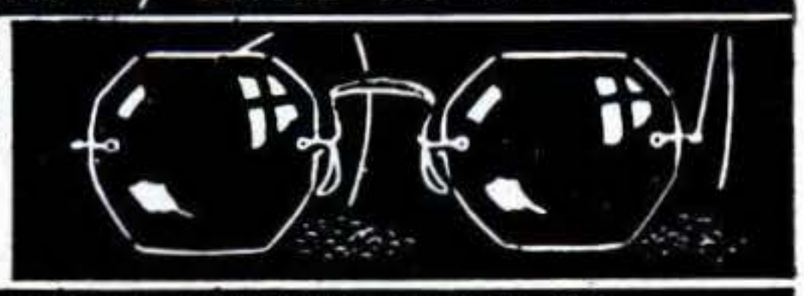

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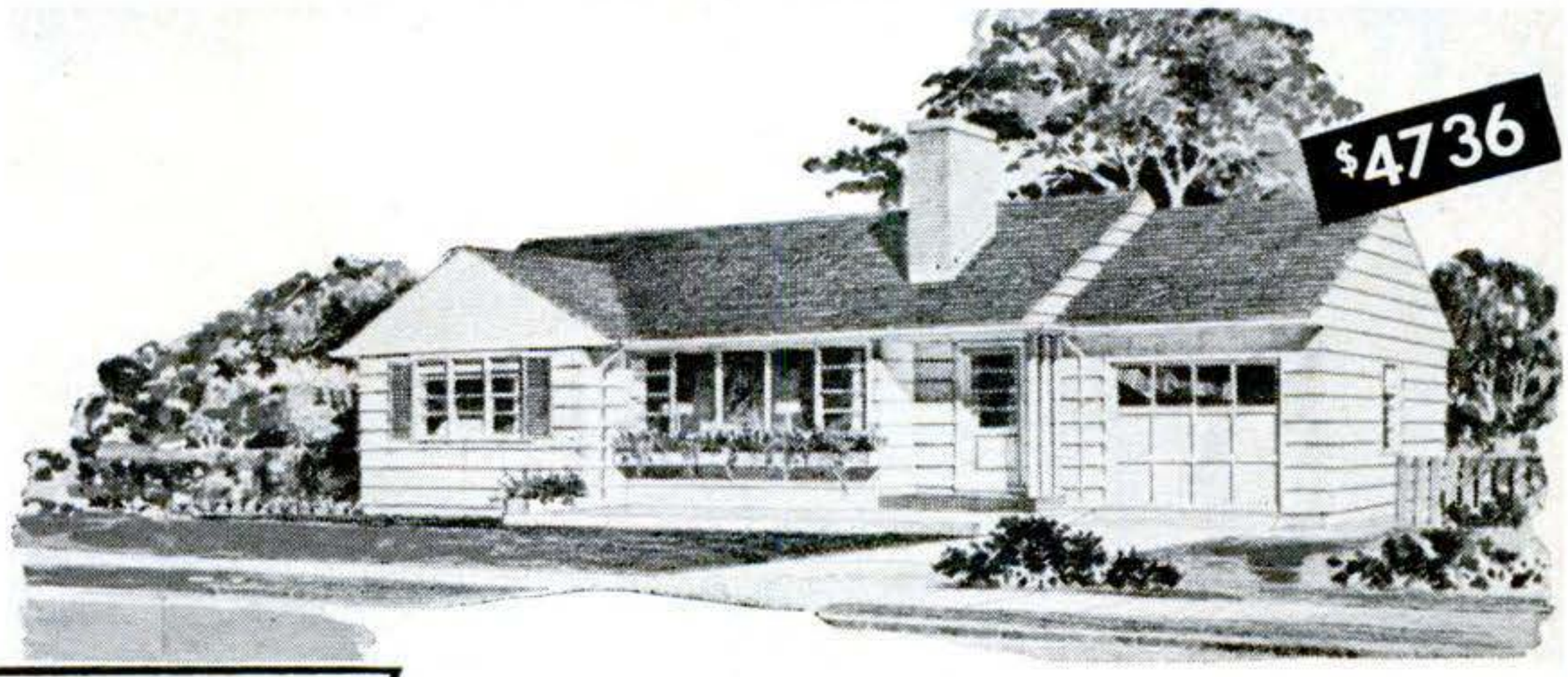

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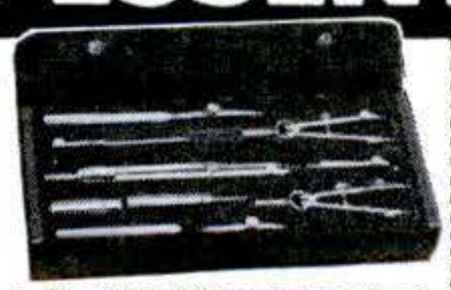

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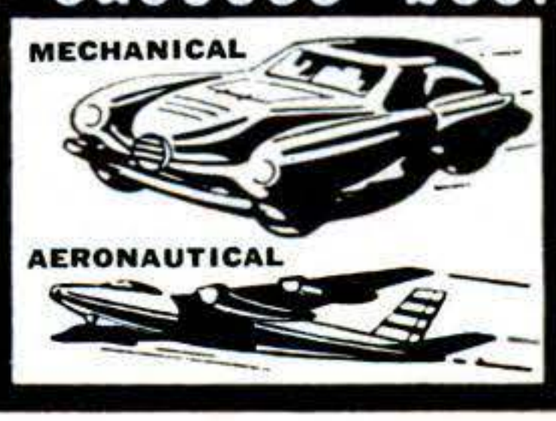

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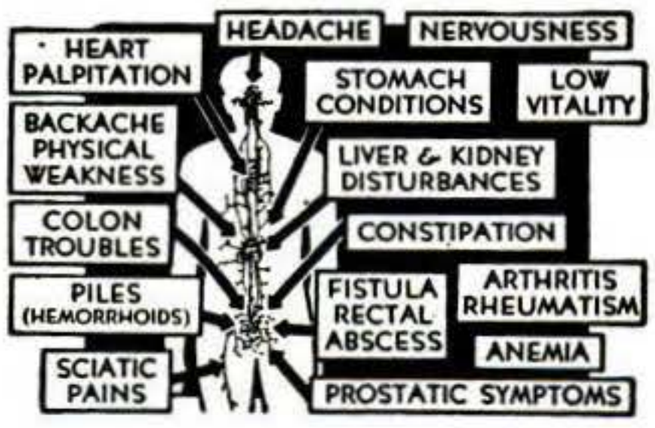

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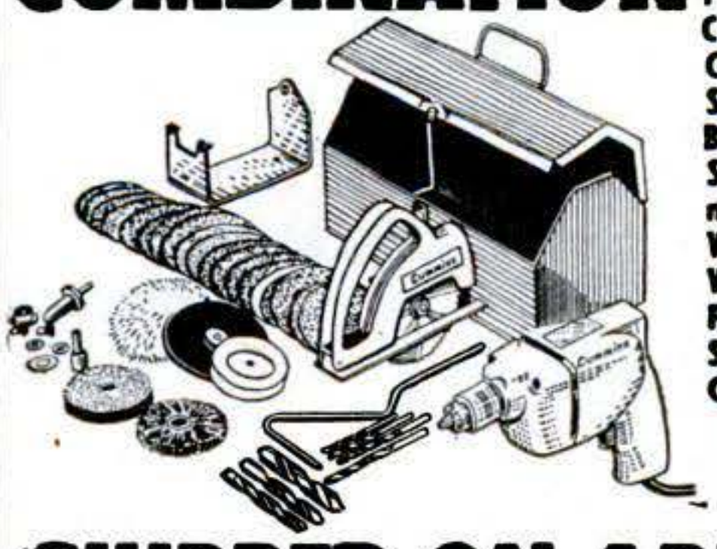

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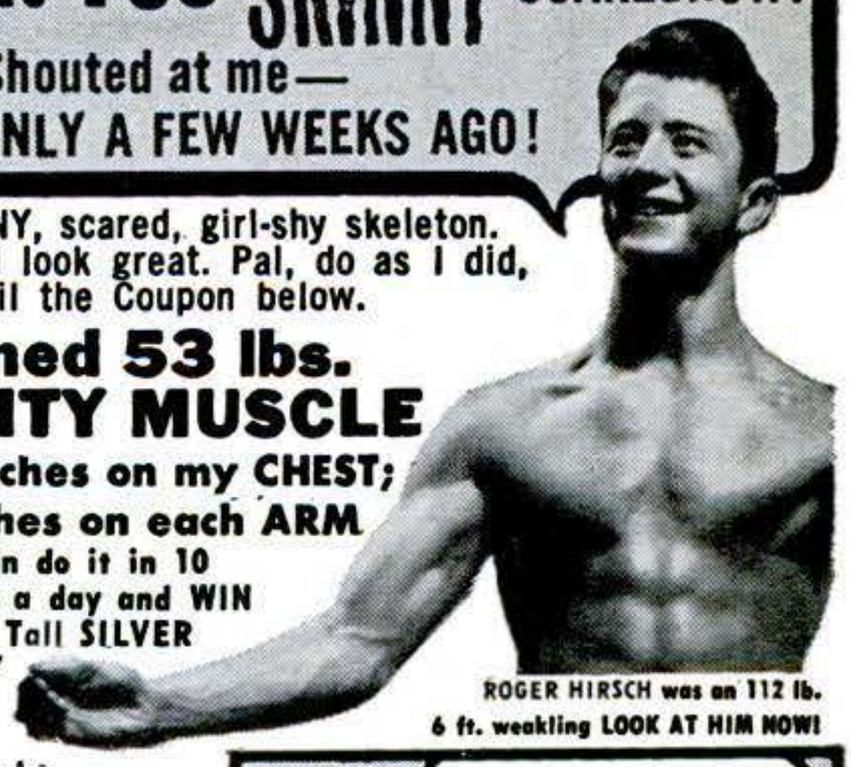

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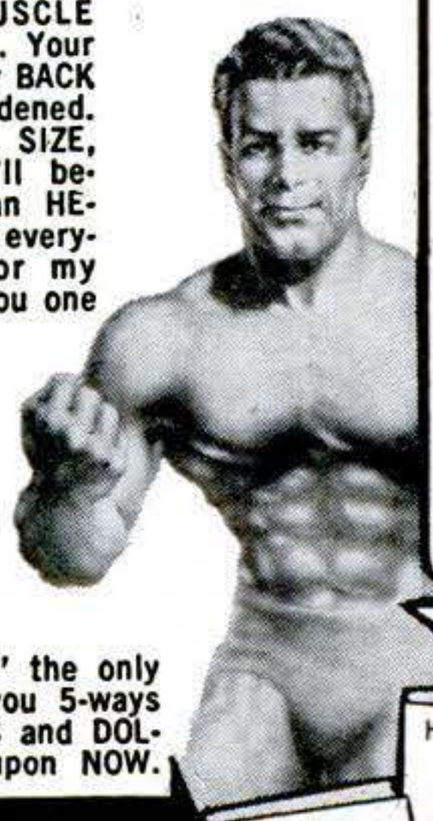

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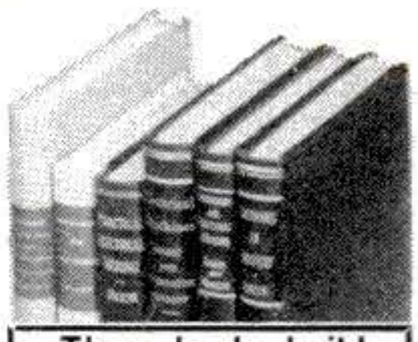

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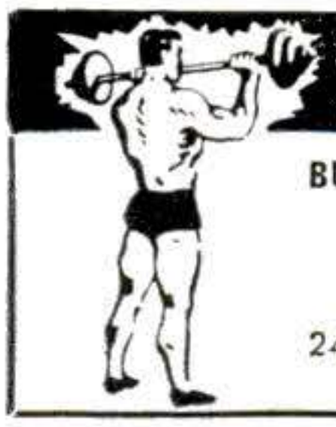

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650x16	5.78	800x15	6.88	700x20	12.88	1000x22	21.98
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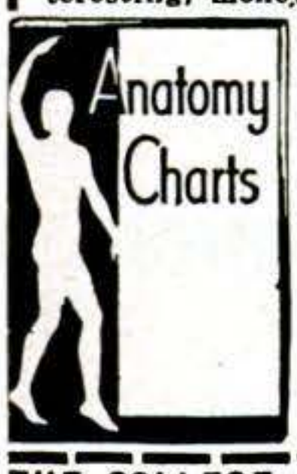

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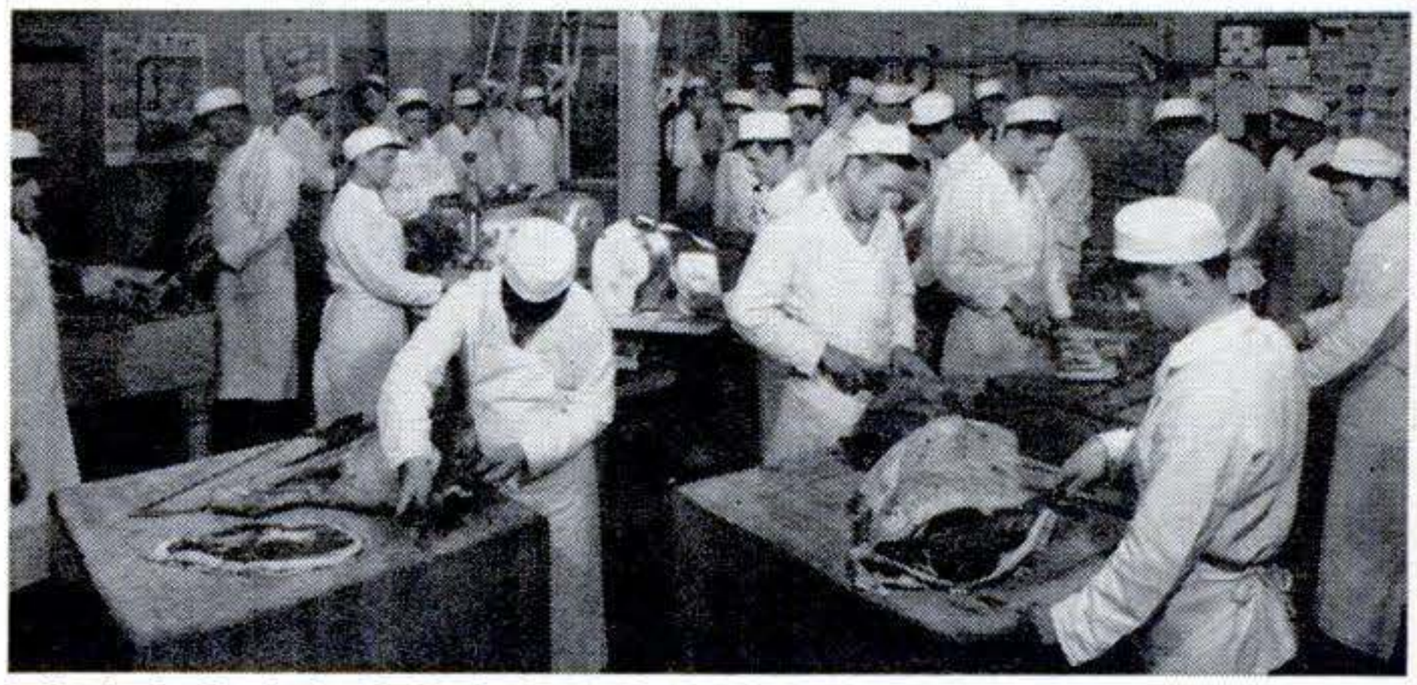

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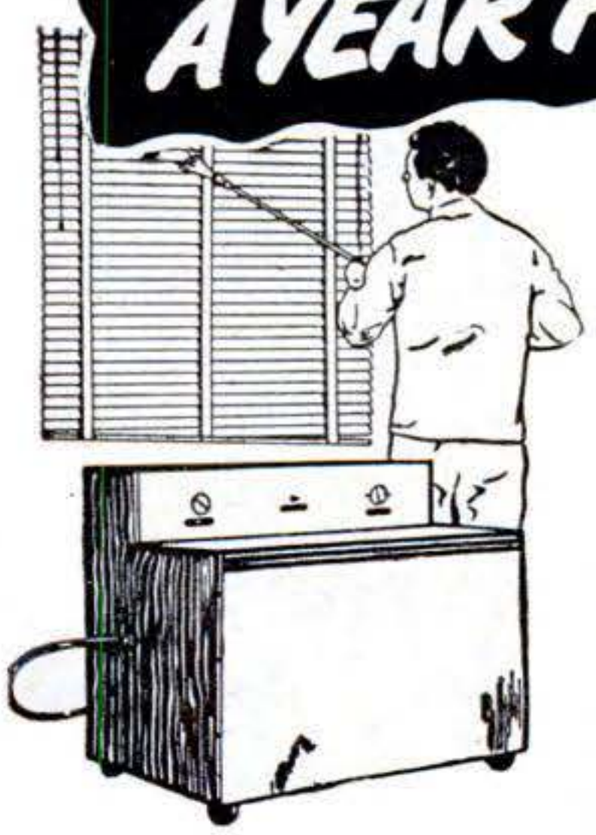

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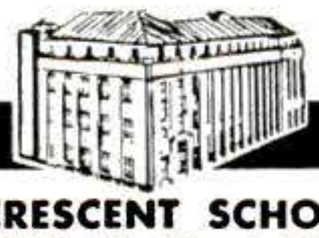

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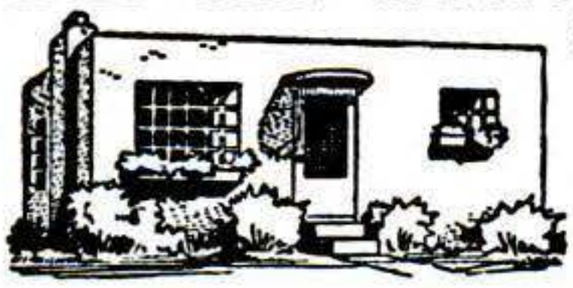

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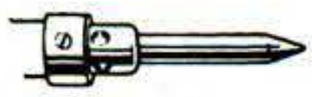

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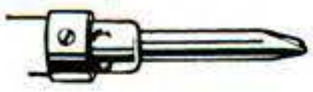

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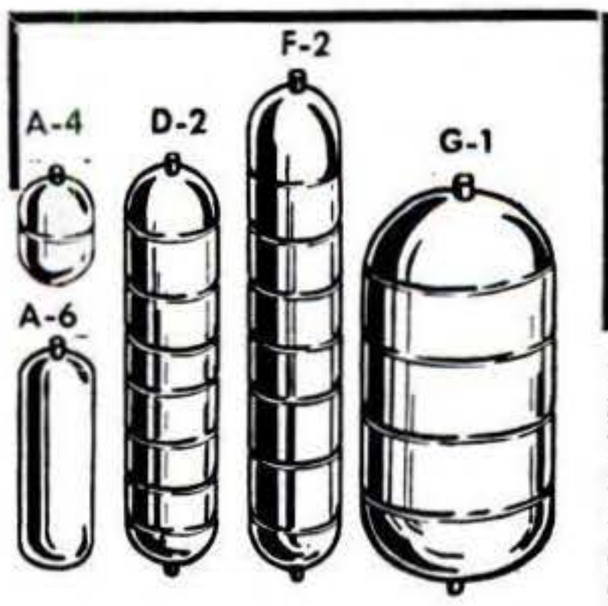

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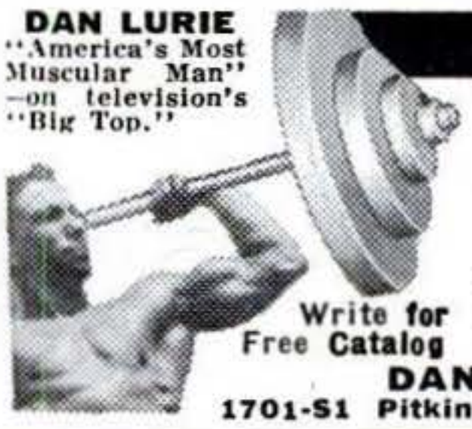

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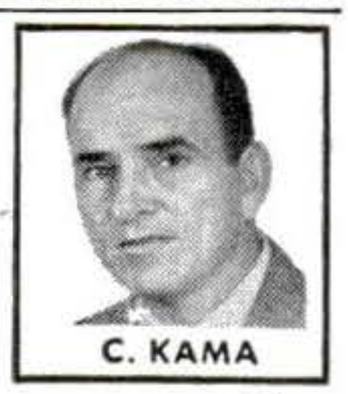
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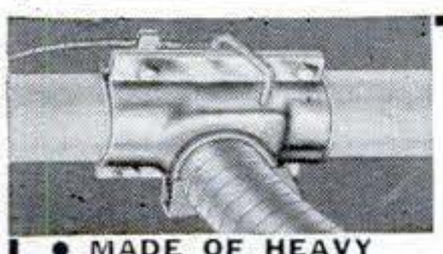

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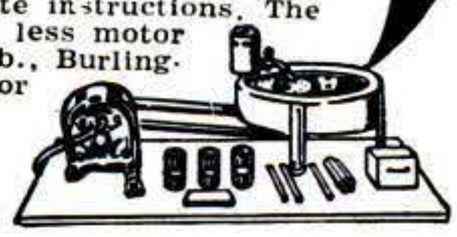

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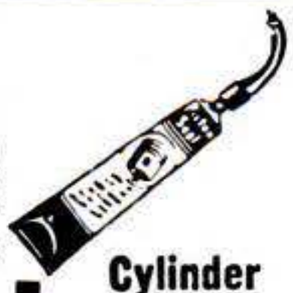

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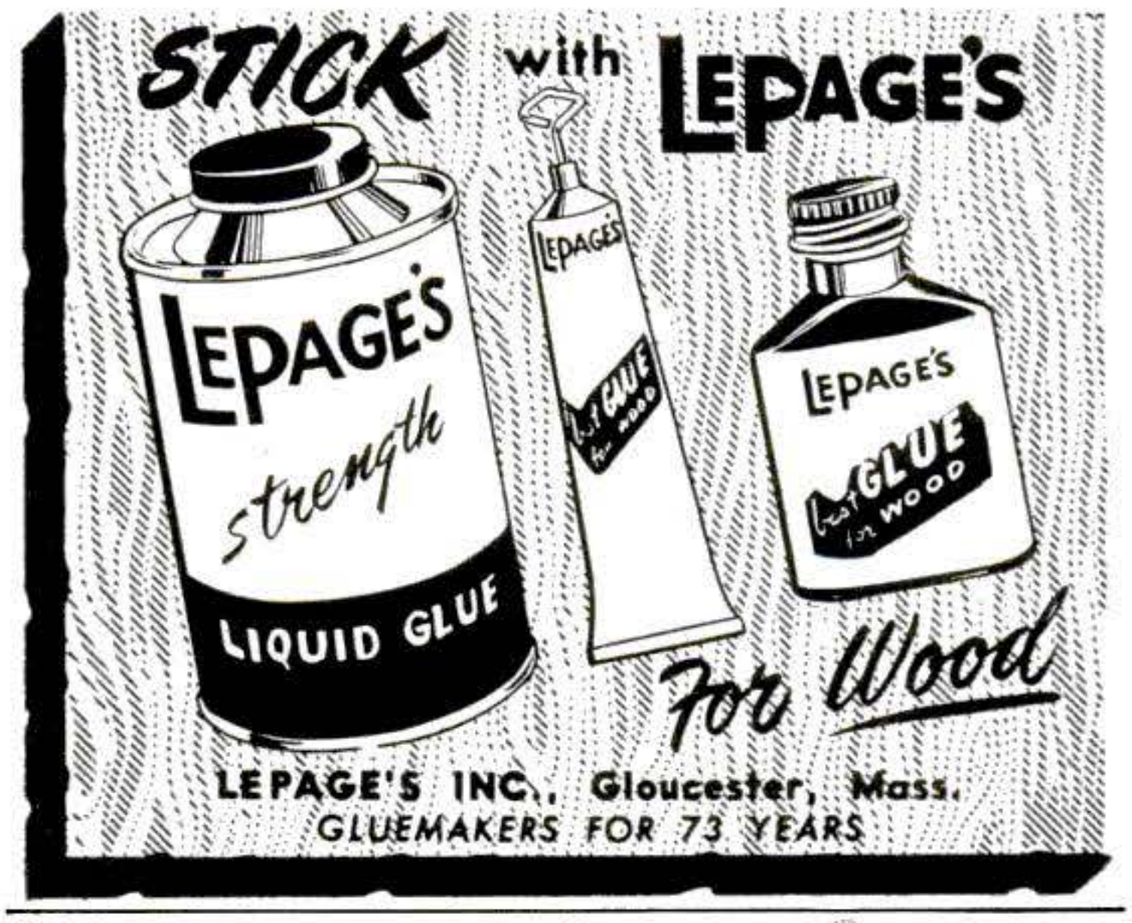

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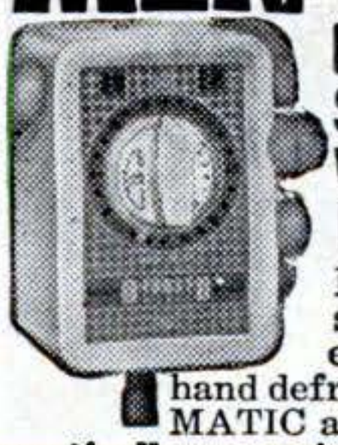

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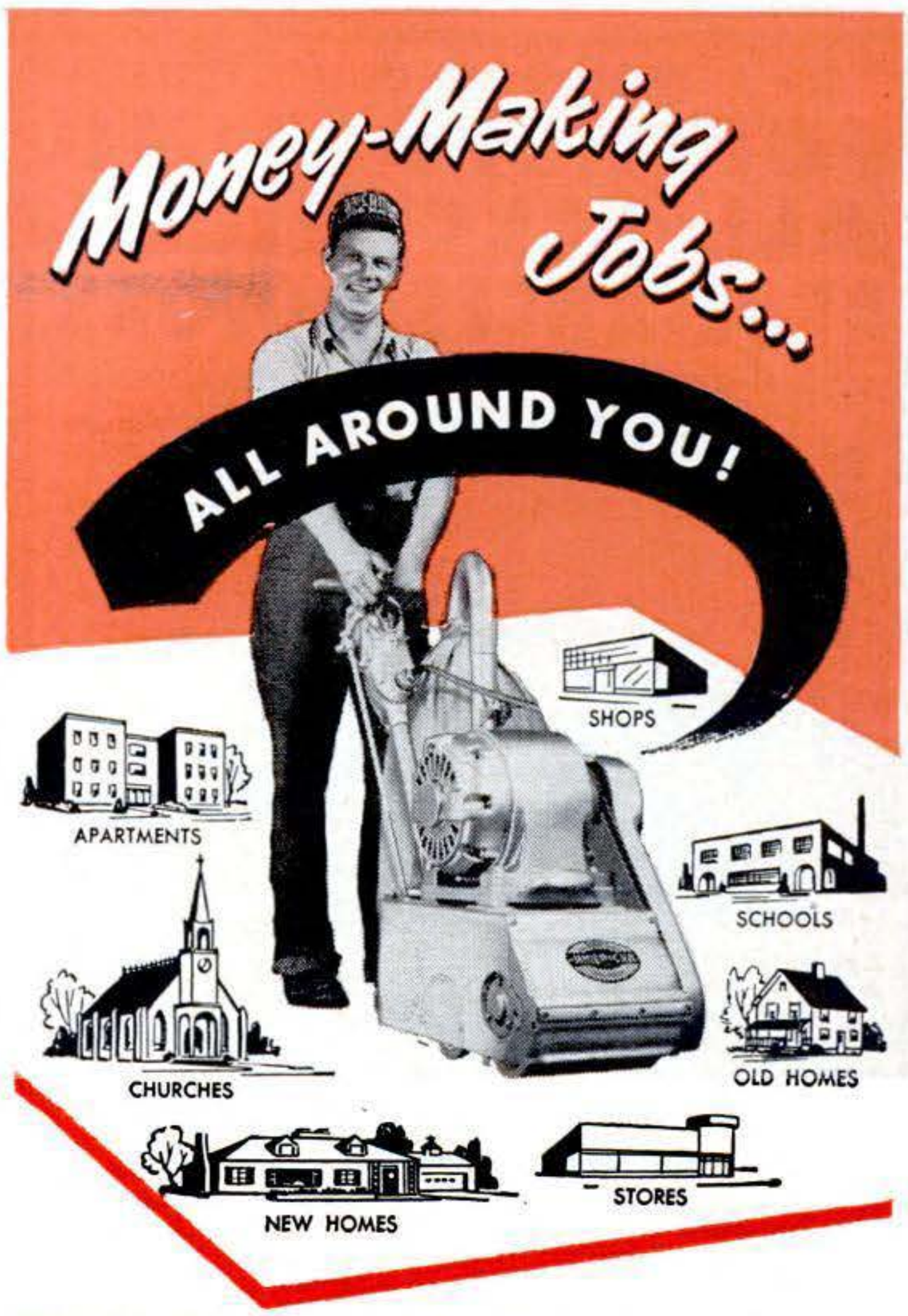

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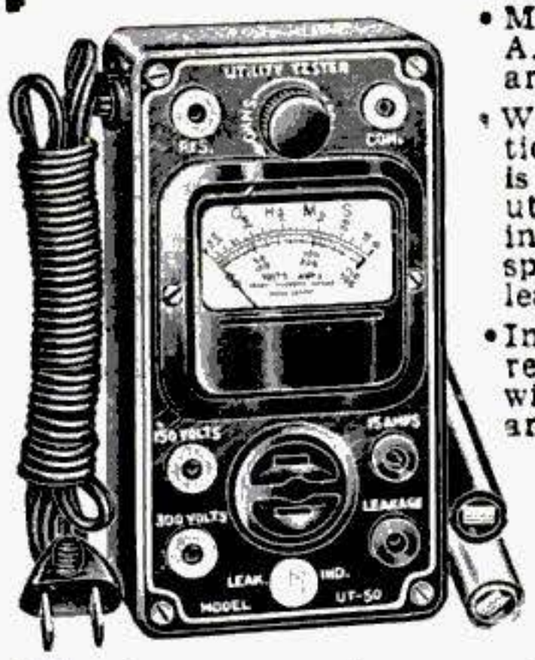

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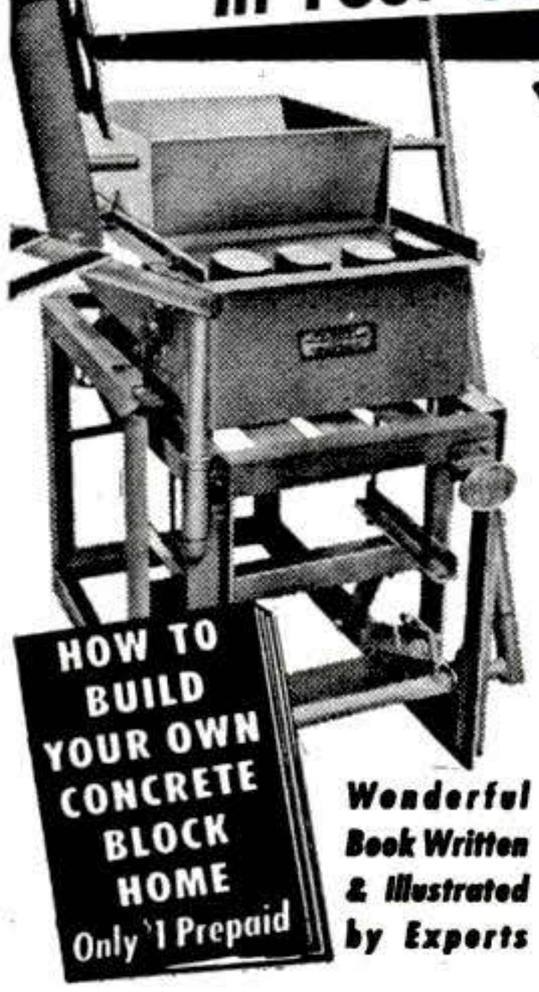

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700-16	6.45	760-15	6.05	750-15	13.95	900-20	17.25
750-16	9.25	800-15	6.55	825-15	12.95	1000-20	17.75
525-18	5.00	820-15	6.65	600-20	8.75	1100-20	19.55
550-17	4.95	670-16	6.35	650-20	10.25	1000-22	19.45
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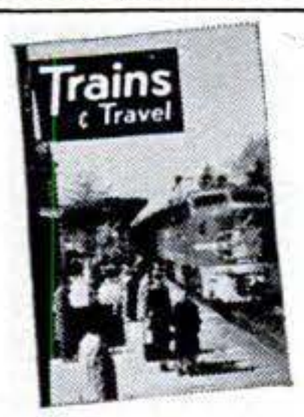

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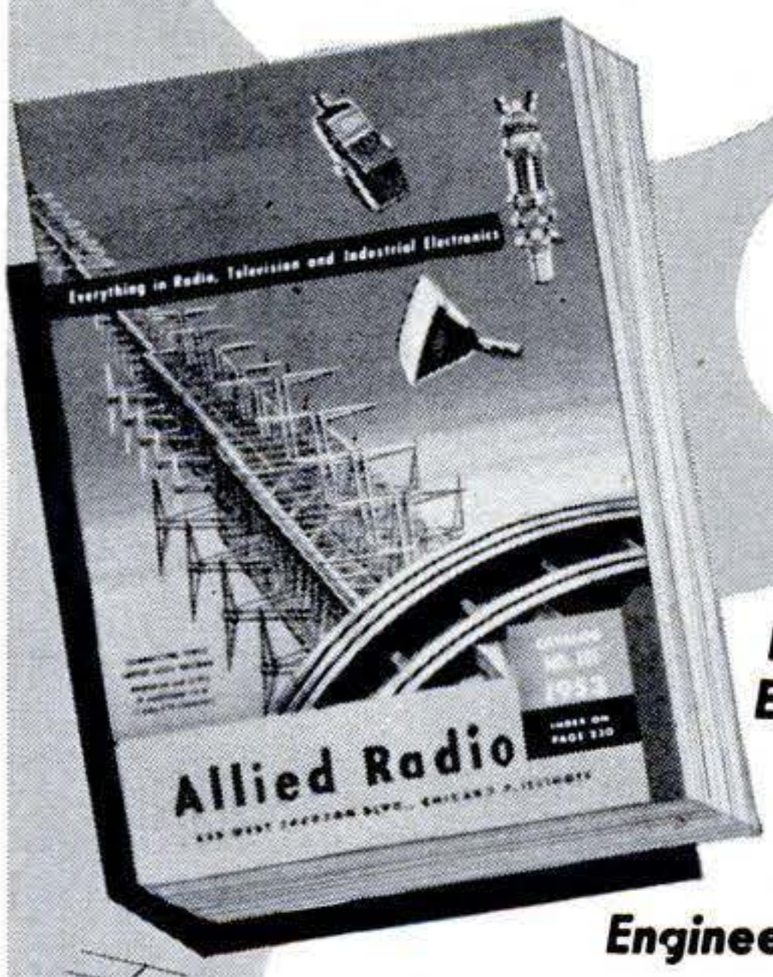

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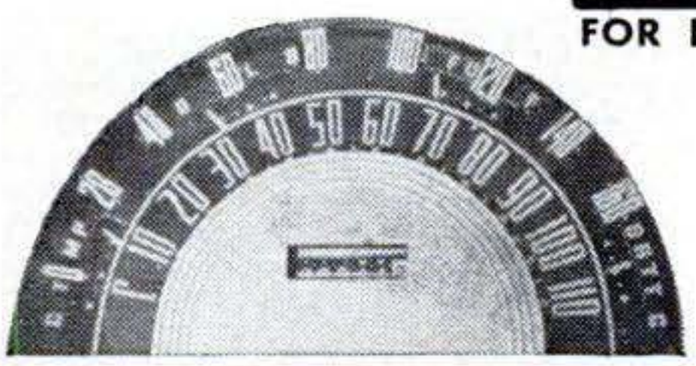

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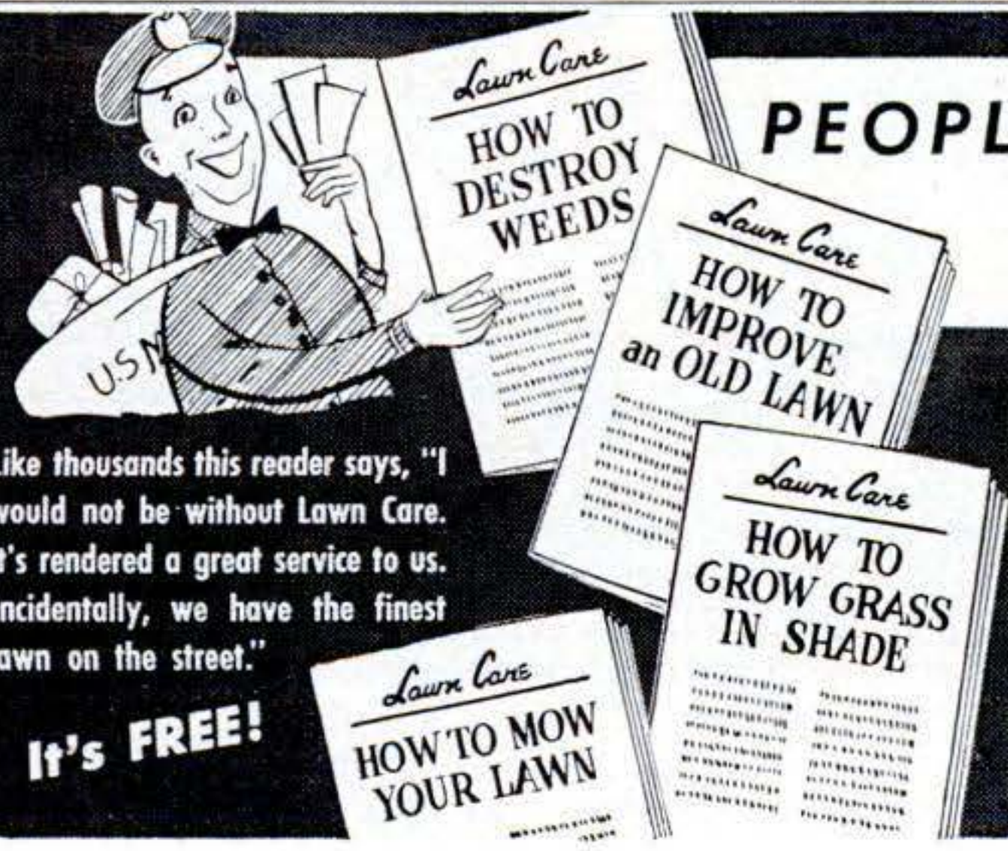

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FOREIGN Employment Construction men, building trades, helpers, office men, others, interested in Foreign Projects. High wages, quarters, transportation. Send $1 for Foreign Construction Compendium and Application Forms. Foreign Service Bureau, Dept. PS-1, Metuchen, New Jersey. (Not an employment Agency—no fees.)

$1,000,000 FOREIGN & Domestic Construction Projects published Monthly, gives Contractor & Locale. How-When-Where to apply with application form. Global Reports, Box 883-PX, Hollywood 28, Calif.

ALASKA!! Last American Frontier. $1.00 brings 1953 Business Directory & Government Map. Military & Civilian Construction; Homestead & Highway facts; Mining, Aviation, Fur Farming, Grazing, Timber, Travel directions. List of firms hiring. How to apply. Alaska Opportunist, Box 883-S, Hollywood 28, Calif.

OVER $1100 a month are wages of clerks, timekeepers and laborers on some construction jobs. For complete foreign job listings send $1.00. Construction Workers Service, 1111 Commerce Bldg., St. Paul, Minnesota.

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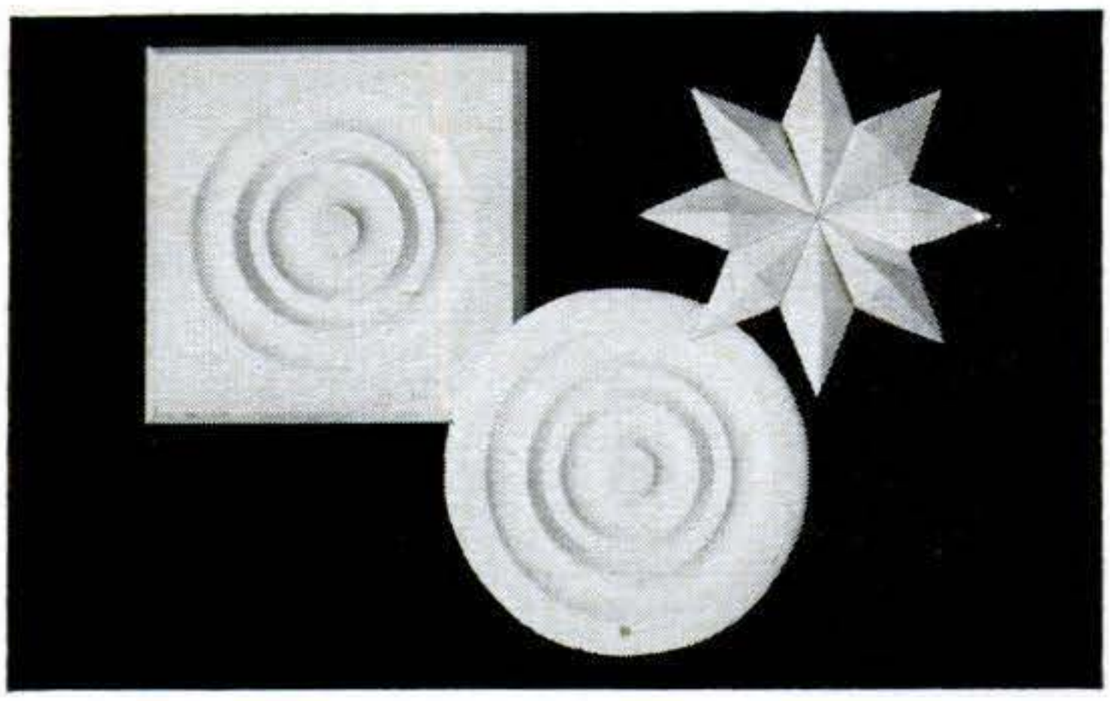

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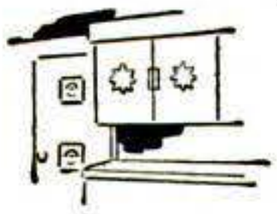

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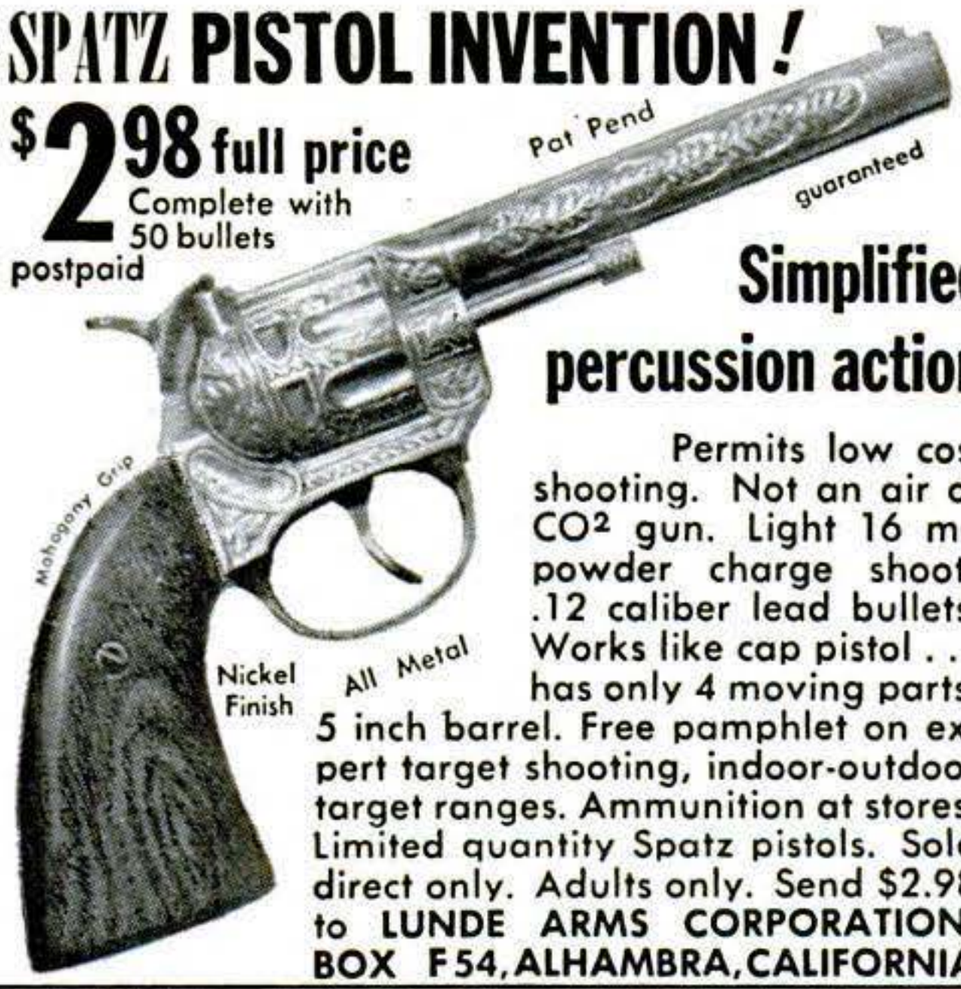

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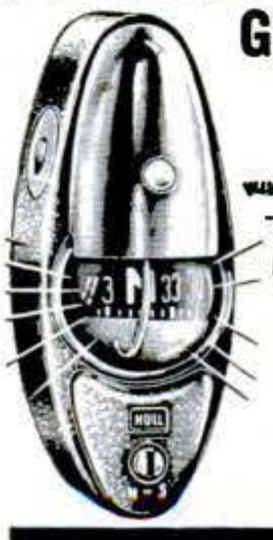

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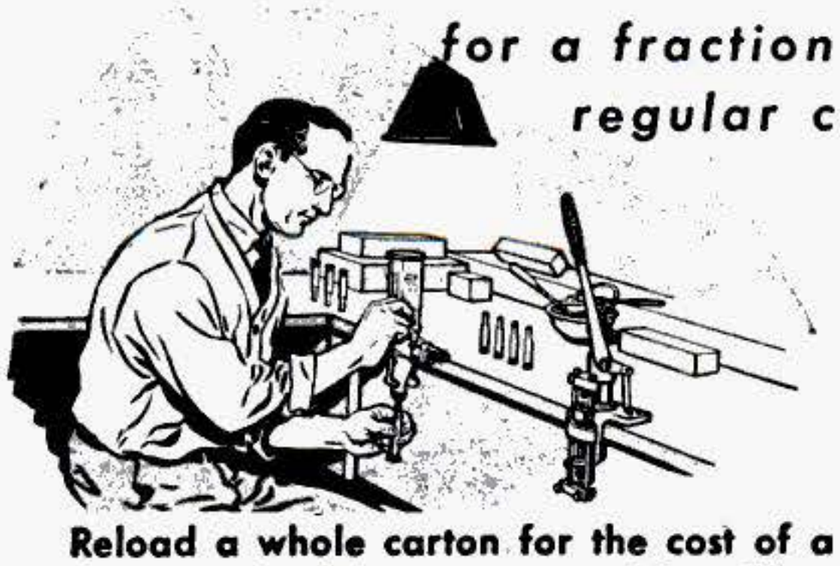

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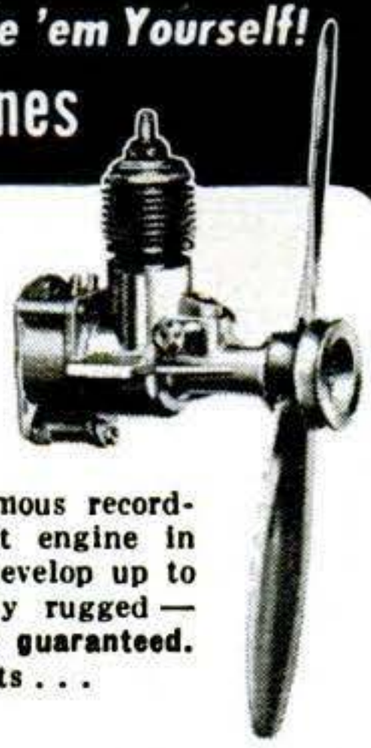

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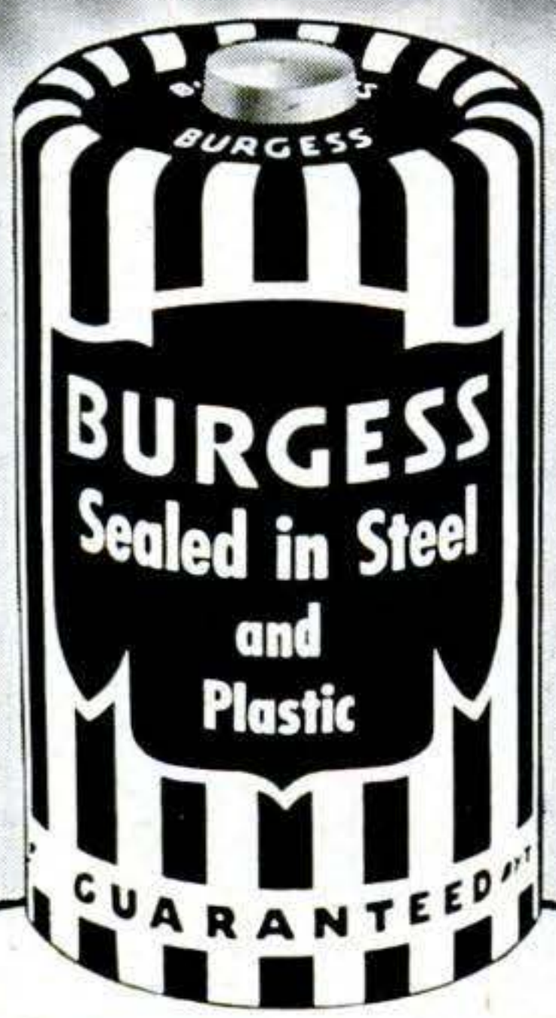

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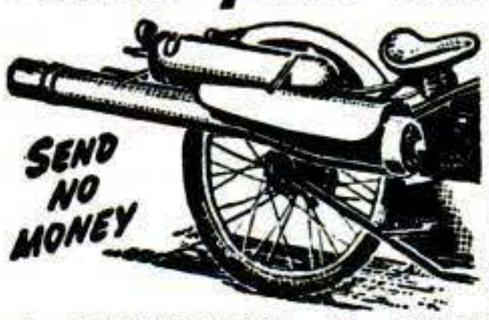

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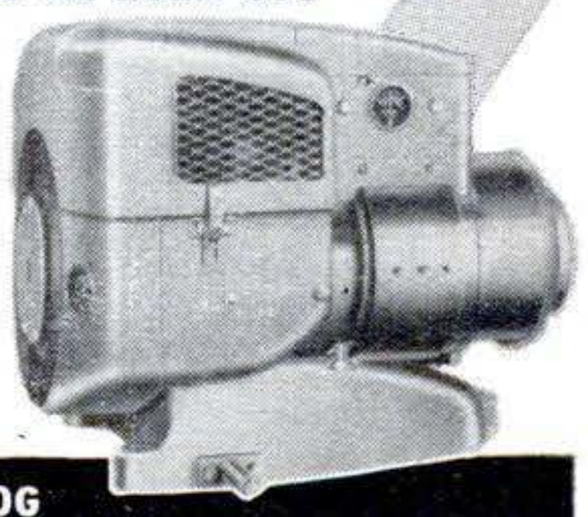

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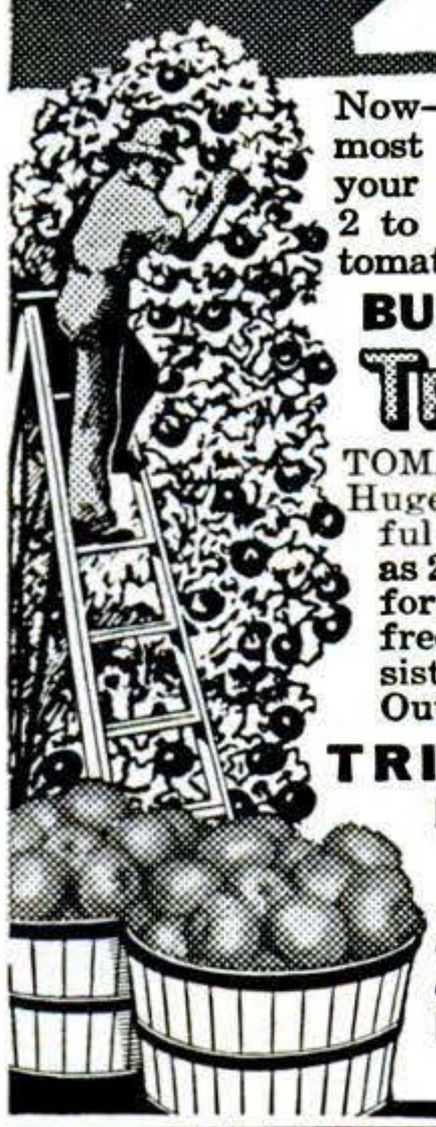

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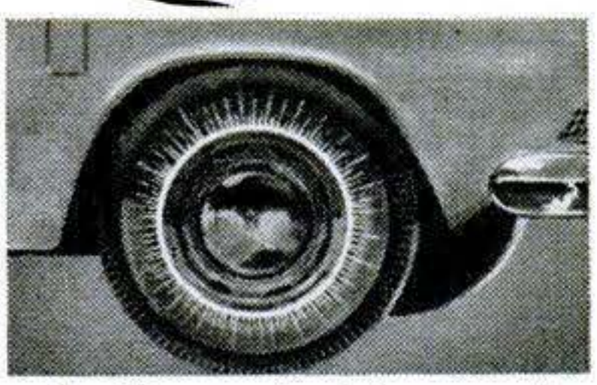

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on car care

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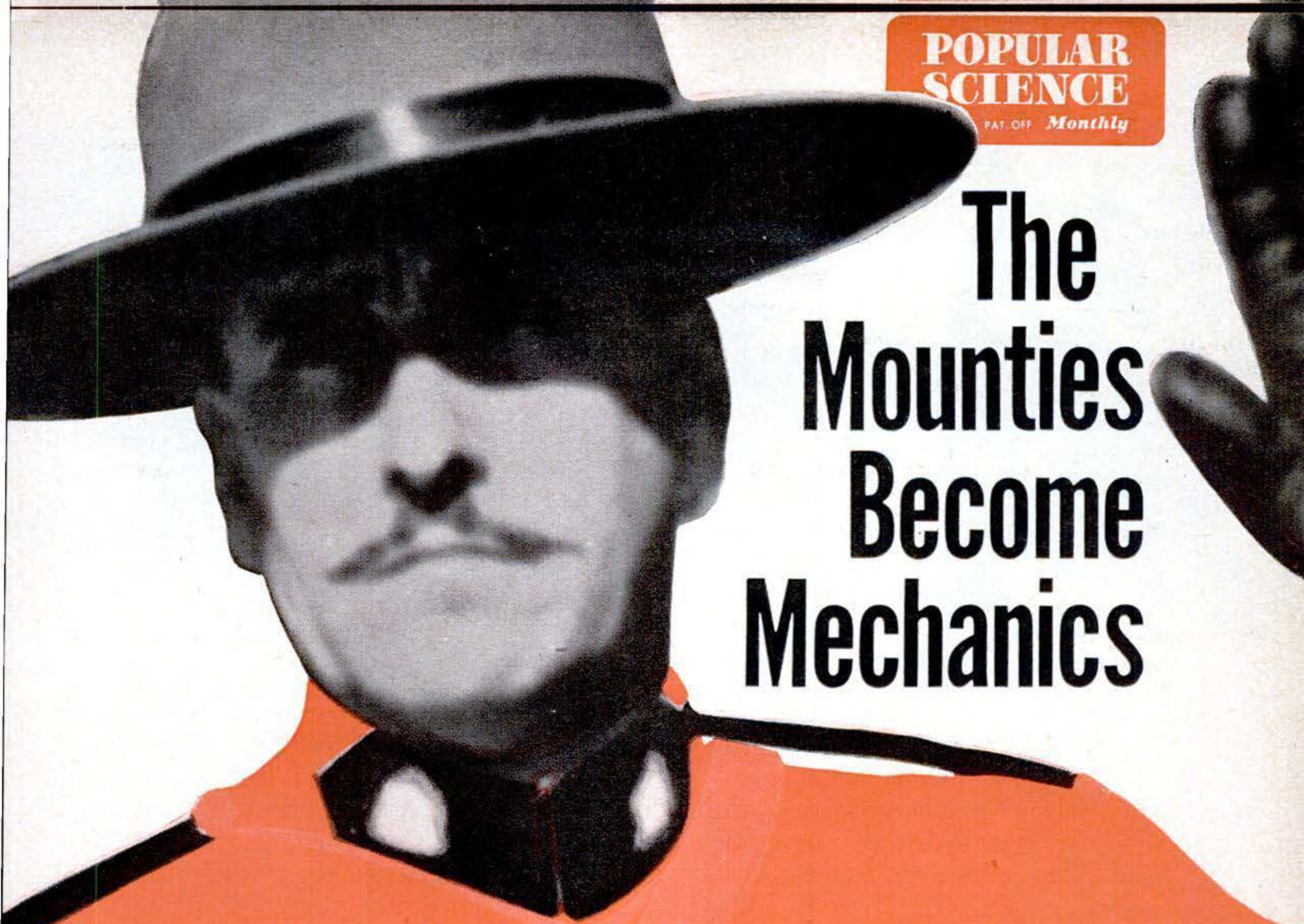

The Mounties Become Mechanics

Motorized mounts and scientific crime detection haven't robbed the Royal Canadian Mounted Police of adventure.

By Richard L. Neuberger

AT THE remote end of a British Columbia fiord the body of a salmon fisherman of the Tshimshean Indian tribe has been found, a bullet hole between his eyes. The dead man's gill nets slosh beside him in the cold green tide.

From Port Alberni, on wooded Vancouver Island, a sleek 80-foot motor launch puts out through the heaving waters of the North Pacific. The throbbing of its Diesels caroms back from the steep shoreline. Aboard are three young men in greasy coveralls. They travel by darkness and by light to reach the scene of the murder.

Into a distinctive footprint they pour plaster to get a mold of the mark left behind by a possible suspect. One of them takes photographs of the Indian's body with a new Speed Graphic. He examines a hair in the cuff of the mackinaw worn by the murdered man and preserves it between glass slides.

From a splintered log on the beach another of the launch's crew pries a dented bullet and peers at it through a lens. He scribbles in a notebook that the bullet probably is of .303 caliber. Then he packs the missile in cotton.

Mounties Are Streamlined Now

These youthful navigators who ride in trim launches, and send their evidence to crime-detection laboratories are members of a law-enforcement organization that is associated in the public mind with sled dogs, prancing stallions and rustic log cabins. They are members of the legendary Royal Canadian Mounted Police.

The Mounties of 1953 are streamlined.

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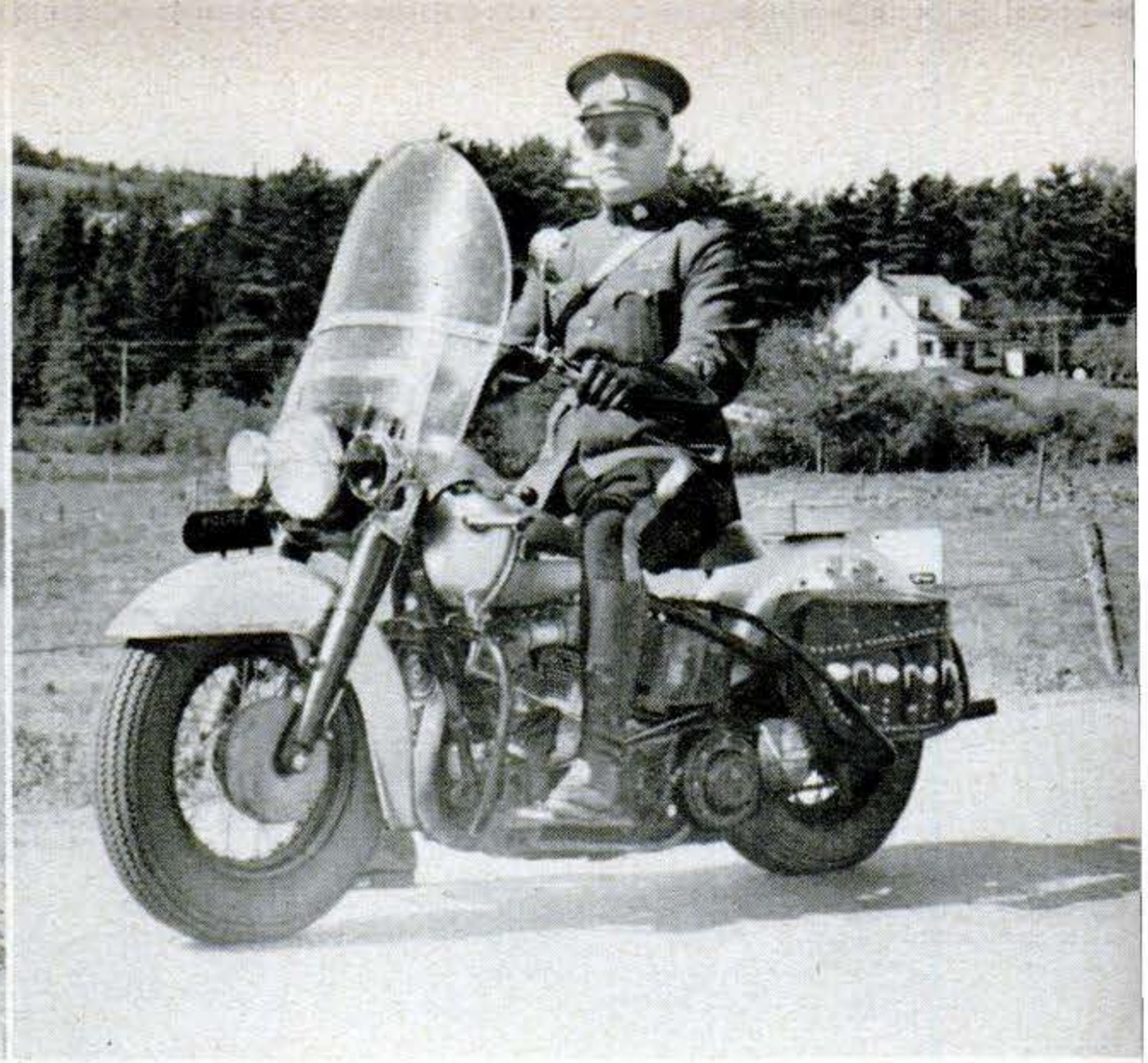
MOTORIZED STEEDS are now the mounts of the Mounties. Here a constable radiophones his headquarters at Swift Current, Sask., while his companion checks a driver's license.



MOUNTIES use almost every means of transportation—including 50 motorcycles. These are seen mostly in Nova Scotia and Ontario. Trooper above patrols roads near Toronto.

mechanized, motorized and fitted with wings, radar and spectrographs. They now have fewer horses—exactly 143 a few weeks ago—than the New York City police department.

The Mountie of old had to know how to break a snarling malemute to the harness, how to bed down 14 evil-tempered dogs on an arctic plain with the aurora borealis crackling overhead. If he traveled the prairie, he had to know how to curry his horse and keep it off glare ice where a fall would mean a broken leg. Now, the first thing an RCMP recruit must learn to do is drive a car.

"Once we needed stablemen, dog-mushers, veterinarians and cowboys," Inspector Edward H. Stevenson, six-foot four-inch police officer in charge of training for the force in British Columbia, told me recently. "Today our requirements run more to mechanics, radio operators, airplane pilots."

On the Alaska Highway the careless motorist may be halted by a warning siren. Behind him is a black-and-white patrol car. Blinker lights surmount the roof. A radiotelephone is on the dashboard. A tall constable strolls over and asks in even tones, "May I see your driver's license, please?"

He wears a tunic of chocolate brown, not the vivid scarlet which is reserved for ceremonial occasions or tourist meccas. From each of the shiny brass buttons fastening the constable's jacket stares a buffalo head wreathed with the motto of the force. This is not, as the movies would have it, "Don't come back until you get your man," but the more dignified and impressive French, *Maintiens le droit*—"Uphold the right."

Upholding the Right

This is exactly what 4,341 Mounties try to do among 14,200,000 people scattered over a greater land area than the United States. The Aviation Section of the force, staffed principally by ex-Royal Canadian Air Force combat fliers, uses a dozen planes to soar into the remote bush, and the Marine Division is a small navy in itself. It has 86 craft and 212 men. Some of the boats are mere outboard skiffs, but others are 112-foot cutters and 162-foot converted minesweepers.

The Mounties also work unobtrusively. John Leopold, born in Bohemia, enlisted with visions of glamorous northern patrols. But as he had a European accent, he was sent instead to join the Commu-

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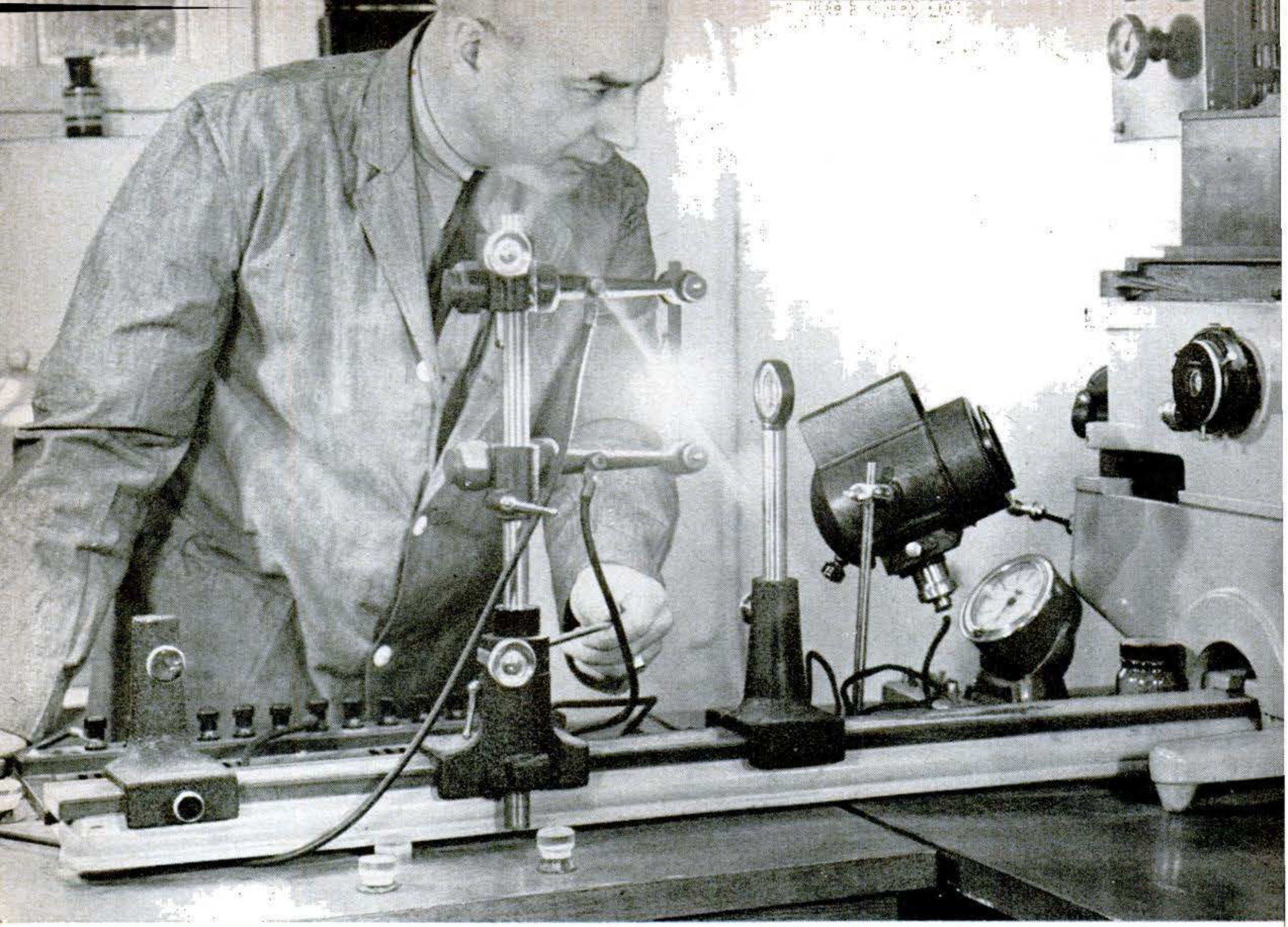
PROUD MEMBER of the Mountie "navy" is the 80-ton, Diesel-powered *St. Roch*. It is said to be the only vessel ever to have sailed both ways through the famous Northwest Passage.

nist party in Canada as an itinerant house painter. He worked his way into the high command of the party and helped to break up a Soviet spy ring in Ottawa.

A Mountie need not have been born under the Union Jack but he must be a British or Canadian subject. When he enlists he should be between 18 and 30 years of age, at least five feet eight inches tall, weigh between 165 and 210 pounds, and have gone through the eighth grade in school.

Six months of training is required to produce a Mountie. Only three out of every 28 applicants are finally sworn in as constables, the lowest rank in the force. Boxing, wrestling, jujitsu—these are some of the physical routines. But the recruit also must learn to punch a typewriter at the rate of 30 words a minute or better. "We want no chicken-track

THE MOUNTED POLICE are sky-riders, too. The Aviation Section, staffed mostly by former combat fliers, keeps an eagle eye on the vast northern wilderness of lakes, frozen wastes.



SCIENCE IN CRIME DETECTION is routine with the Mounties. Above, a constable at Regina laboratory, serving all Western Canada, uses spectrograph to study a piece of evidence.

reports on important cases coming out of the North," says Inspector Stevenson.

As a matter of discipline and morale, a Mountie learns to handle a horse expertly. As a matter of necessity, he is taught how to repair, maintain and operate a car, because the force uses 1,219 motor vehicles.

Mountie Must Learn Many Skills

The Mountie of 1953 must be familiar with physics and chemistry, and these scientific realities he encounters in the crime laboratories at Regina and Rockcliffe, which rival the labs of the FBI, Scotland Yard and the Sureté.

He learns how to record fingerprints and how to read them. He is taught how to operate a camera. He masters ballistics and he finds out about toxicology.

Why this rigorous schooling? I once asked the question of Stuart Taylor Wood, who retired not long ago as the top-ranking Mountie of them all, holding the title of Commissioner.

"Being a member of the RCMP is more than being an ordinary policeman," replied Commissioner Wood. "The Mounted Police have many detachments where only one man is stationed. He may be hundreds of miles from another post. He must have innumerable skills. He may have to be doctor and nurse one moment, a cook the next and magistrate still later. And he must have a sense of tradition and history. That is why he never wears a red tunic until graduation day. He may not wear it very often again, but it has for him rich significance."

Wood's successor as boss Mountie is 48-year-old Leonard N. Nicholson, a compact, graying man and a crack rifle shot. Commissioner Nicholson's annual salary is $15,000. An inspector gets $6,000 a year, a staff sergeant $3,900, a sergeant $3,600, a corporal $3,300 and a

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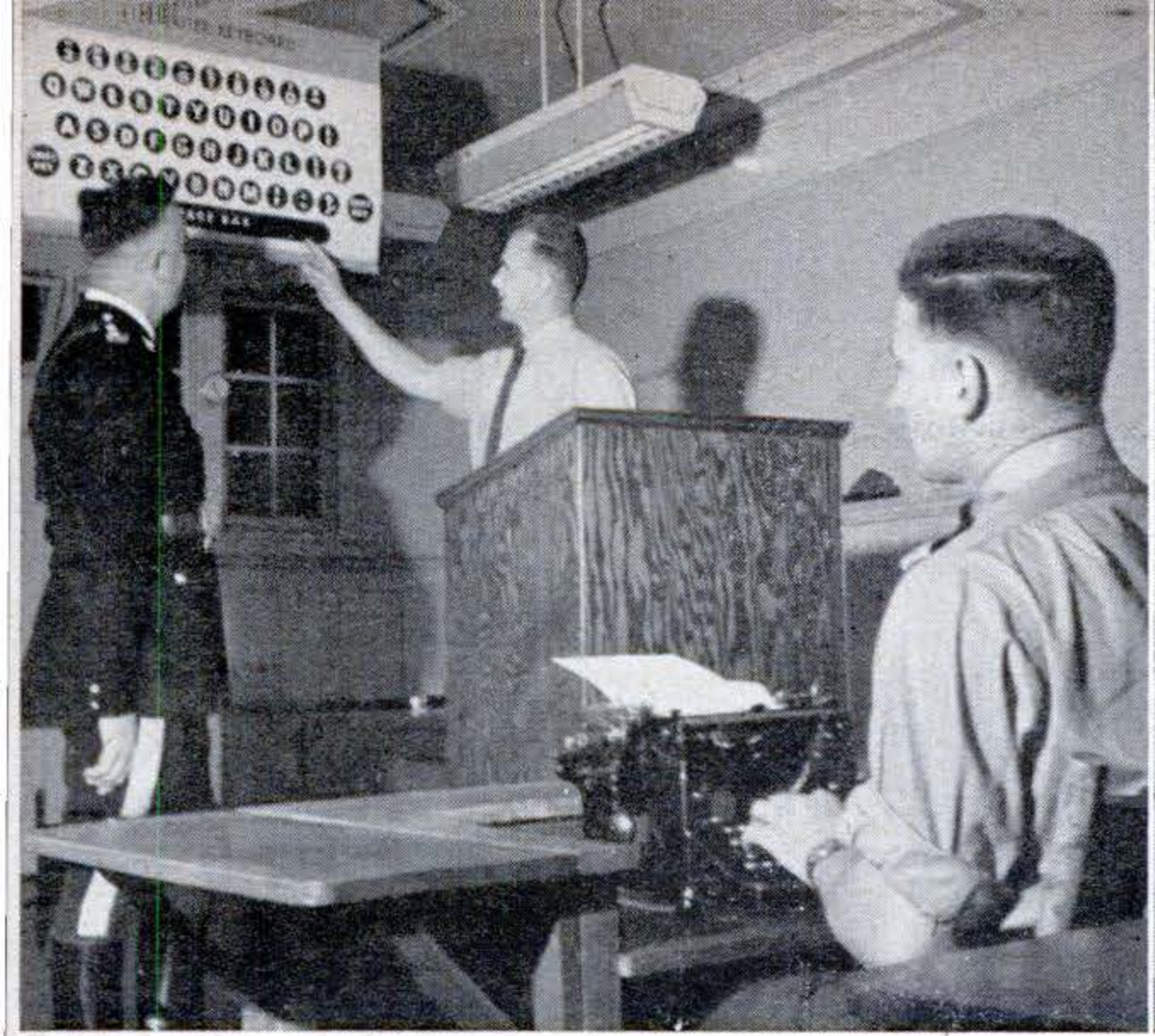

RECRUITS learn to become typewriter jockeys at Fairmont Barracks, Vancouver. The ability to make clear reports in the field is an important part of every Mountie's job.

FINGERPRINTS taken at the scene of a crime in the distant wilderness and later identified in a Mountie crime lab have brought more than one lawbreaker to the end of his trail.

beginning constable $2,520. Living allowances also are provided and a member of the force may retire with a pension at the end of 20 years of service.

They Often Work Alone

Aptitude tests are given to all who enlist in the Mounted. Since this famous force rarely sends two troopers to do one trooper's job, Mounties frequently are on their own. This calls for quick thinking if the right is to be upheld.

In the western ranges a trapper was murdered. His furs were gone. The trapper had cured his skins in a certain fashion. Sooner or later those skins had to show up somewhere. A Mountie pinpointed the most obscure trading post in the area. The trapper's murderer, he felt, would be more likely to trek there than to a more conspicuous post.

Trap for a Murderer

When at last the pelts of the slain man were turned in, the factor flashed a warning glance to the logger in corduroys who whittled by the stove. Soon the slayer heard the ominous words of the criminal code: "I arrest you in the name of the King and warn you that anything you say may be taken down in writing and used against you in court."

A prospective Mountie must be single when he enlists and he cannot marry for at least five years afterward. Even then, he may not take a bride without the permission of his commanding officer. I asked Assistant Commissioner C. E. Rivett-Carnac, who commands the 777 Mounties on duty in British Columbia, the justification for this rule.

Single Man Can Go Anywhere

"Our force has to have real mobility," he replied. "This is particularly important in the North. A young man who is single can go anywhere. He can live in a tent, a shanty, an igloo or a Quonset hut. Furthermore, a young man who is single often can be free of the responsibilities which might restrain a married man from undertaking a long and perilous mission."

But once a Mountie has served his five-year hitch and gets married, his wife may go with him, no matter how remote the outpost. Many of the most isolated detachments consist of a house divided equally between living quarters and a police office. When the Mountie is away on patrol, the wife may operate the radio which maintains contact with a distant headquarters. In the Alberta bush north of Edmonton I met a statuesque

[*Continued on page 262*]

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Balloon-Launched Rockets Measure

ALTHOUGH cosmic rays can penetrate 18 inches of solid lead, you can't always check theories about them inside a cozy laboratory. Scientists went to the opposite extreme recently—wind-swept, iceberg-strewn Baffin Bay in the Far North.

From the rolling deck of the Coast Guard icebreaker *Eastwind*, they launched their measuring instruments in rockets that hitch-hiked part of their rides on gigantic plastic balloons. Fired at the peak of the balloon travel, the rockets reached altitudes of 40 miles. There was no need to recover the instruments, since all data was radioed from the rockets back to the *Eastwind*, where it was recorded and analyzed.

The frigid location of the expedition was chosen because it is near the earth's geomagnetic pole, where cosmic rays are least affected by earth magnetism. Measurements made at high altitudes there most closely indicate the condition of the strange cosmic rays as they exist in outer space. The expedition was part of a program of cosmic-radiation investigations being carried out jointly by the Office of Naval Research and the Atomic Energy Commission.

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New Navy Jet Has Top Striking Power

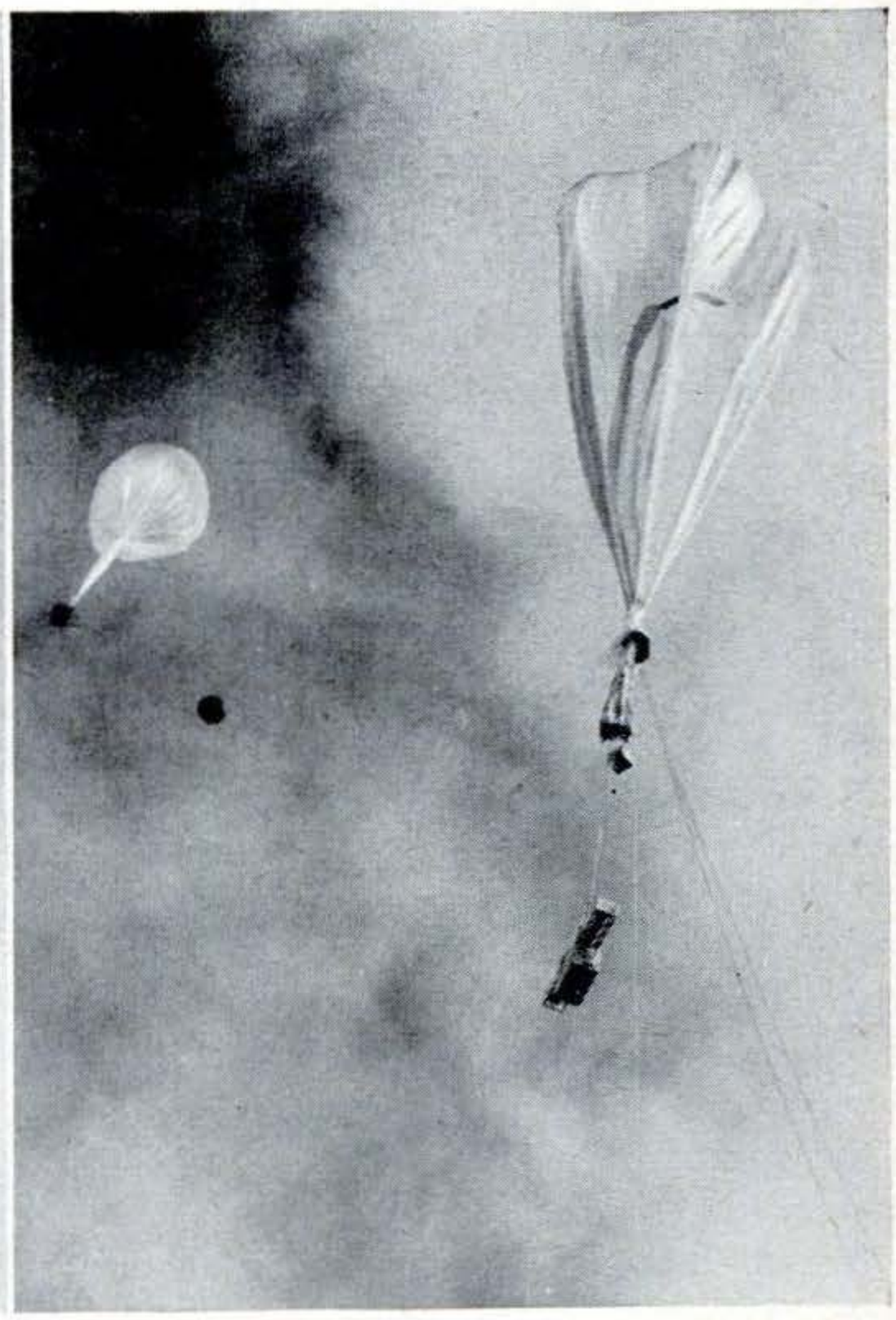
THE hottest carrier plane ever built is the Navy's new Douglas A3D pictured in the painting at left, just recently flight-tested for the first time. Designed to fly faster and farther than any previous type, the swept-wing, twin-jet attack-bomber will carry the largest carrier-launched bombs and torpedoes—and that presumably means the A-bomb—to strike at far-flung enemy installations.

Although it is the Navy's largest bomber, the jet is small and light in relation to its striking power. As a combat plane, it is in the 600- to 700-m.p.h. class, with a ceiling above 40,000 feet. It will also be used as a mine layer and for photo reconnaissance. A pilot, pilot-bombardier, and gunner-navigator make up its crew. Both wing and tail fold for storage aboard carriers.

Tired Enough for an Accident?

How much work can you do before fatigue lines you up for an accident? In its safety campaign, du Pont built this stationary bicycle to find out. An electrically loaded wheel supplies the work, while wires carry indications of blood pressure and pulse to technicians in another room.

Cosmic Rays 40 Miles Over Arctic



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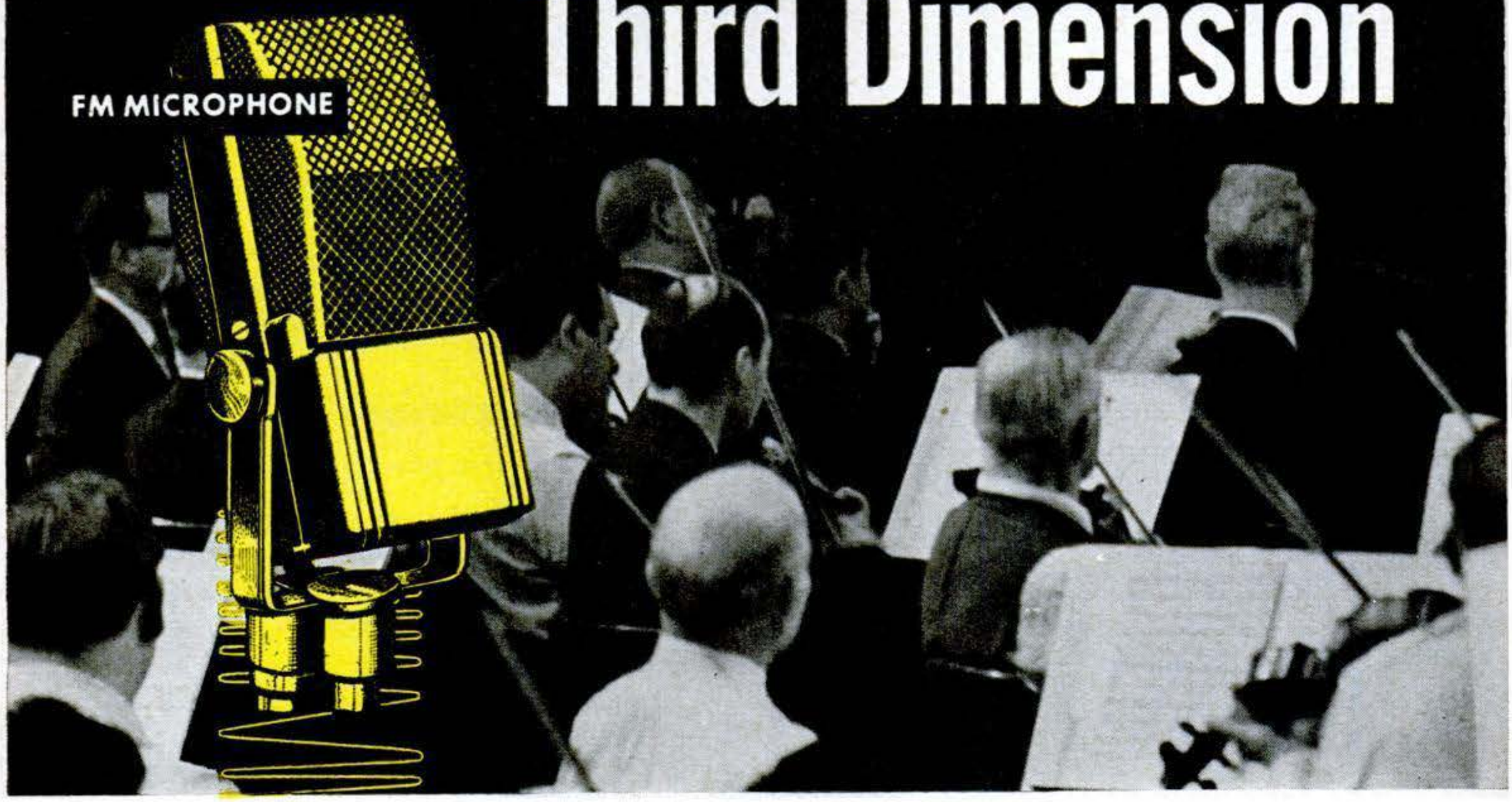
Radio Adds Third Dimension



Broadcasting's greatest stride since frequency modulation puts musicians to left and right of you, in true perspective.

By Henry B. Comstock

A NEW type of radio broadcast, so realistic that you will know just which end of the sofa to dive under when Poncho lets blaze with his Colt .45, is ready for you. It will be on the air whenever you and a hundred million other dial twisters ask for it.

Fifty-six years ago, gramophone-cylinder cartons carried the slogan: "Absolutely faithful to the original." So you may be pardoned if you now dismiss such boasts as meaningless surface noise.

But great strides have been made in reproducing sound—with super-sensitive microphones, frequency modulation, and speaker units which can talk in the 30-cycle-per-second fundamentals of the pipe organ, or in the 15,000-cycle harmonics of the piccolo or violin.

Yet all of today's commercial broadcasting still shares a basic defect of Edison's first talking machine. It lacks the three-dimensional quality of live sound, or what the engineers call audio perspective.

"Never heard of it," says the average listener, "so how do I know what I'm missing?"

Try this experiment. Close your eyes and press a hand tightly over one ear. Then locate, if you can, the source of some sound in your living room, or out on the street. Let's assume that this sound conveys a sensation of movement. An increase or decrease in volume tells you that. But can you say, with certainty, that it is moving from left to right, or vice versa?

The chances are that you cannot. This proves, according to the experts, that you were given two ears, not to double your hearing, but to serve as a highly

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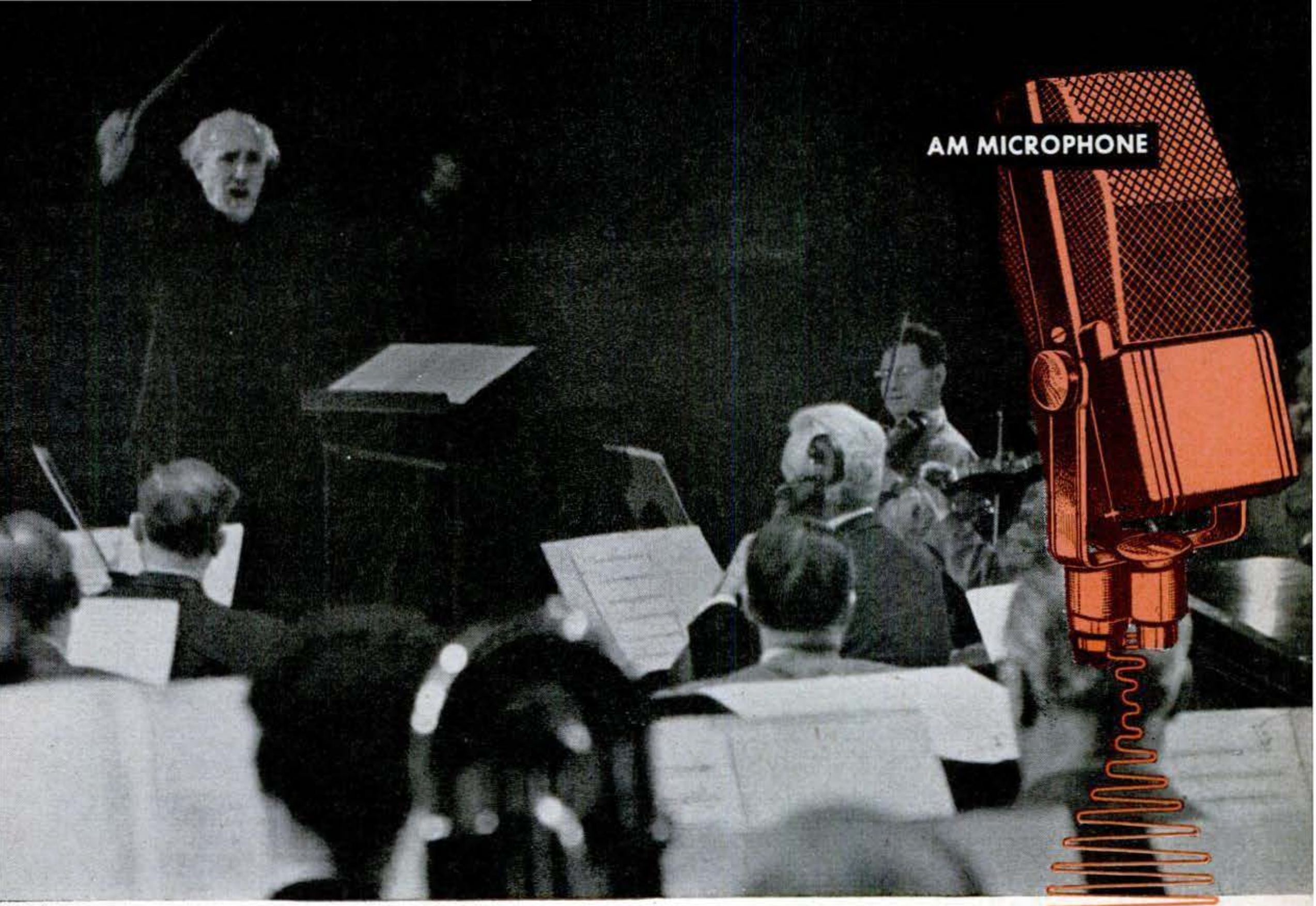

sensitive sound hookup. Your two-source, or binaural, hearing helps you to duck taxicabs behind you. And it is also essential to your full enjoyment of sound. Without it, you would never thrill to the directional richness of a circus band as it swings out of Dugan's Alley onto Main Street.

Yet the most perfectly designed radio sets, and all of the costly equipment used to channel programs into them, fail to bring you this enjoyment. Sound engineers spot their mechanical ears throughout the studio as carefully as a conductor arranges his musicians. Then they blend the output of these mikes into a tasty stew, which is generally dished out to you in a single bowl—the cone of your loudspeaker.

Now, suppose that instead of pouring the output of a number of mikes into one speaker, the engineers were to set up two mikes, one at either side of a live orchestra, and funnel the separate outputs, one to each of your ears through a headset. That would give you a startling effect of sound perspective. The string section would be properly separated from the brass, soloists would stand out from an instrumental background. There is only one catch. Few listeners want to go back to earphones.

How about substituting two loudspeakers? "Fine," say the audio engineers. "That is, provided you place them at least 10 feet apart, and at equal distances from the listener. Naturally the acoustics of the room will destroy part of the effect of realism which earphones give you, but

YOU NEED two radios—one AM and one FM—to bring present stereophonic broadcasts into your home. Each reproduces the pickup from a separate microphone.

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TWELVE-INCH binaural record has two sound tracks, is played with a dual tone arm. Recorder, earphones, speakers and disks are sold by New York's Harvey Radio Co.

not enough to dampen your enthusiasm for a brand-new broadcasting thrill."

In 1933, early champions of stereophonic sound tried out this experiment at the Chicago World's Fair. Using two widely-spaced microphones, they sent out broadcasts of each pickup over separate AM station bands. That broadcast came too soon. In those days few listeners could afford two home radios.

Today, the whole situation has changed. Quite apart from huge radio and television sales, manufacturers of phonographs produced more than 825,000 record players in 1952. That gives you some idea of the market for a sound "extra" which promises good listening.

Revived at Audio Fair

With this in mind, New York City radio station WQXR-WQXRFM recently revived stereophonic broadcast experiments as a special feature of the 1952 Audio Fair. The technique was different this time. Equipped, as its call letters indicate, for both AM and FM broadcasting, the station channeled the output of one microphone into its AM band and the other into FM.

Listener reaction was tremendous. There was only one complaint. Many listeners reported that superior FM reception tended to shade the AM pickup. This raises an interesting possibility for stations broadcasting both FM radio and television, since TV sound is also FM. By adding two balanced FM sound channels to a TV picture, they could bring a whole new world of realism into your parlor.

What about canned broadcasts? Transcriptions have become a dominant factor in the industry. Can they be made stereophonic? The answer is that they can and have been. Stereophonic records were made as long ago as the early Thirties, using a combination of lateral wave and "hill and dale" (vertical) cutting, to produce two separate sound tracks in a single groove.

The system now in commercial use is less complicated. Two grooves are cut in one side of a 12-inch record, one spiraling inward from its outside circumference, and the other from a point midway across the playing surface. In the playback, two heads on a single tone arm pick up the individual recordings and send them to two speakers. The chief selling point of the stereophonic disk is the ease with which any number of duplicates can be pressed.

Available on Tape

Stereophonic tape is also available. While it does not lend itself to mass-production recording, it provides a simpler system of synchronization. A standard quarter-inch tape, passed over two reproducing heads, receives two parallel recordings, and the playbacks are carried to separate speakers, or into the individual earpieces of a headset. Two manufacturers are now offering such equipment, and both describe it as binaural. If you are a stickler for accuracy, you may object to that definition when it is applied to loudspeaker reception. Technically, stereophonic sound is binaural only when you hear it through a headset.

But whether you call it binaural, stereophonic, three-dimensional or audio perspective, this new medium of sound reproduction is now yours for the asking. Whether or not it will become a part of your daily radio diet depends upon how long you are satisfied to hear studio broadcasts through a keyhole which only lets you use one ear. END

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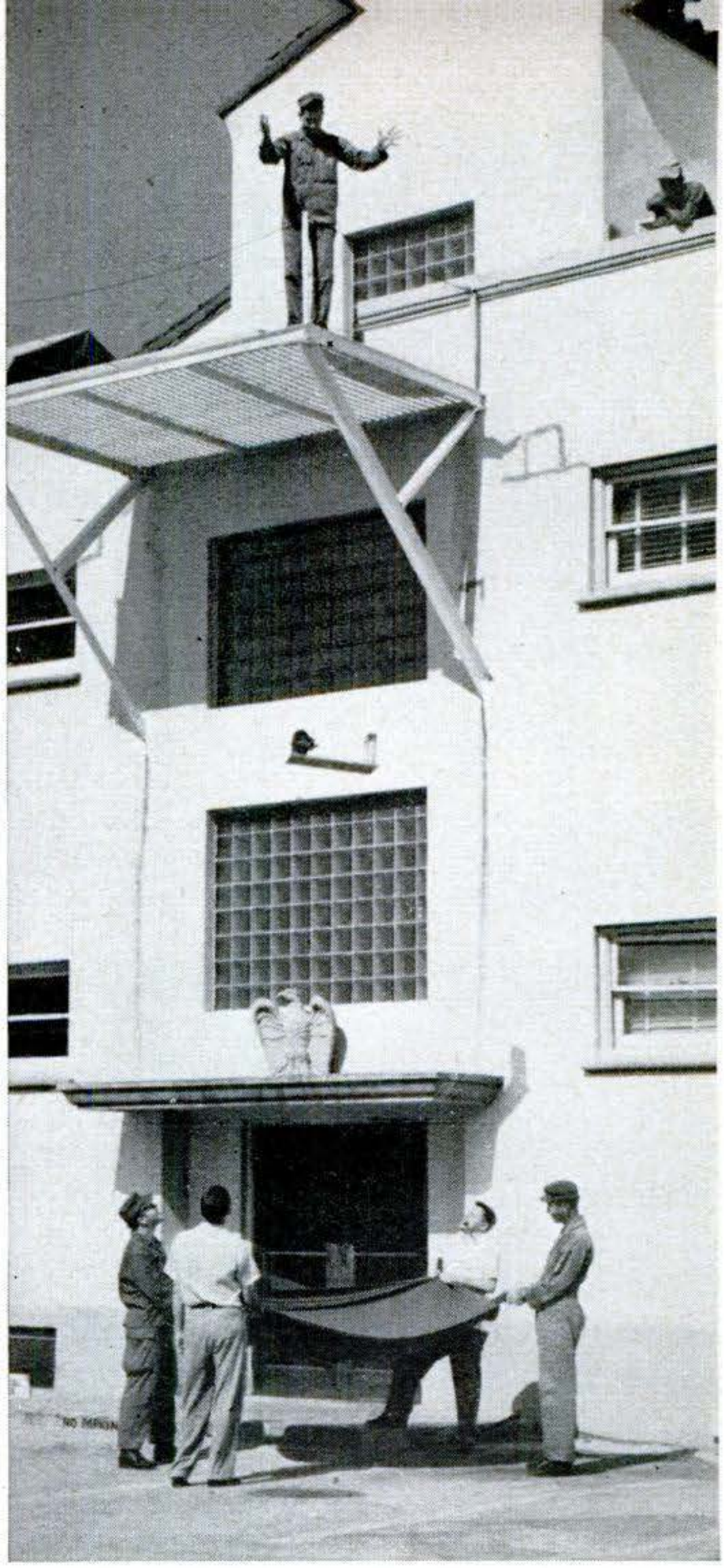
They Use Bubbles to Prepare for Flight into Space

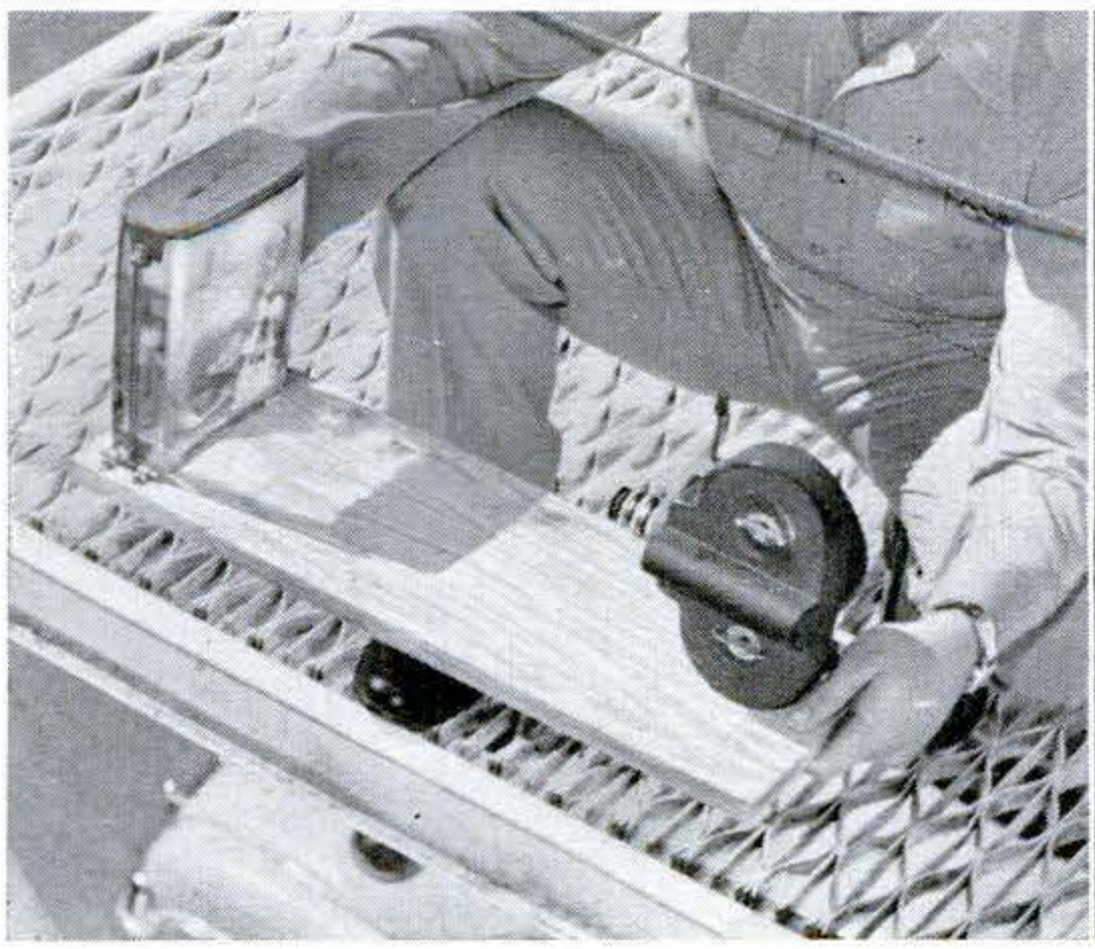
PHYSICISTS will tell you that any freely falling object has no weight. But they do not recommend jumping off a building to prove it. A safer demonstration has been figured out by Dr. Fritz Haber, space-flight expert at the Air Force School of Aviation Medicine, Randolph Field, Tex. He does it with movies.

The photos on this page show how. His main prop was a bottle of plain water containing dry ice in the bottom to make bubbles. This was fastened to one end of a board with a movie camera attached at the other end. The whole thing, with the camera running, was then dropped from a platform near the roof of a building (photo at right). During the second or so while the bottle was in the air, the bubbles, instead of rising, were suspended in the water. That proves they had no weight, and neither did the water or the bottle.

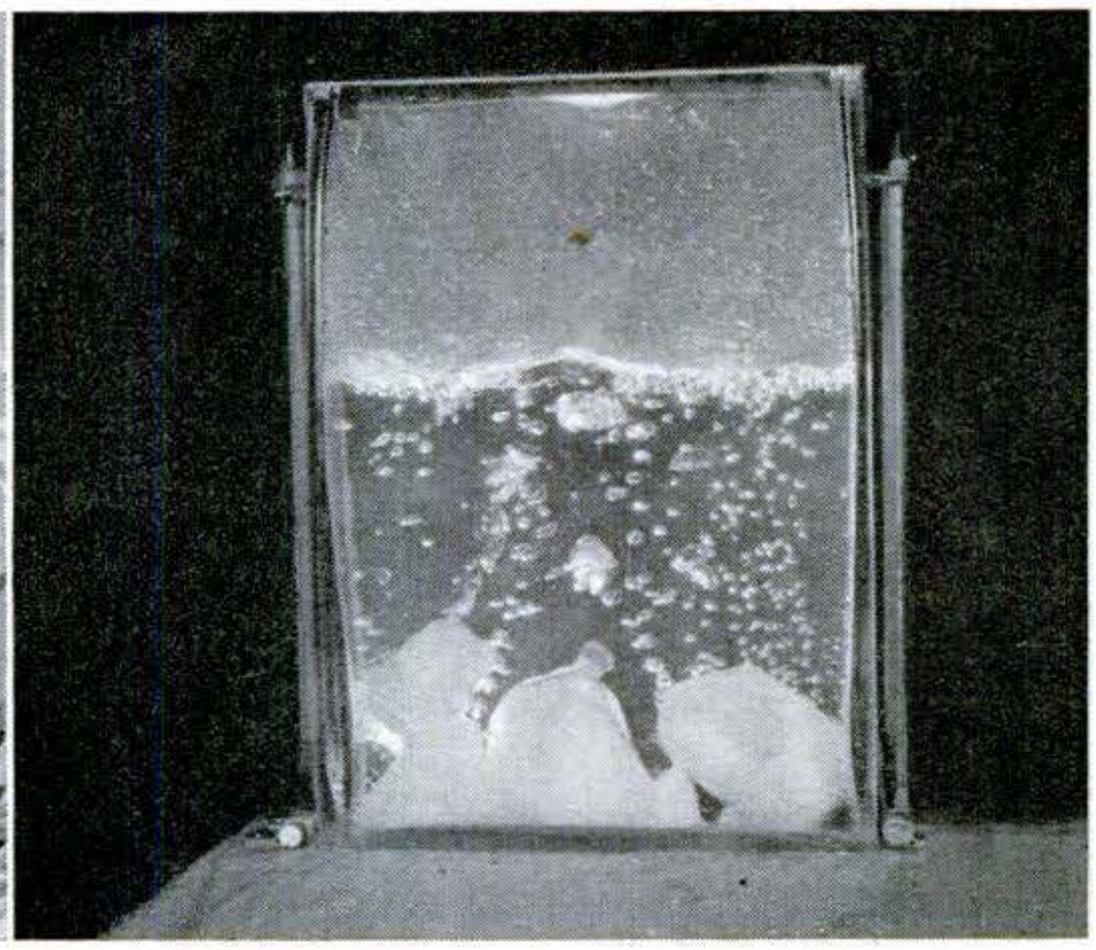
Reason for the studies is that similar weightlessness is experienced momentarily by pilots of high-speed jet planes under certain conditions. And future space travelers will have to go through long periods without weight (PSM, Dec. '52, p. 88).



BUBBLE-BOTTLE and movie-camera gadget to show weightlessness of falling objects was rigged up by Lt. Arthur P. Thiesen, photo officer at the School of Aviation Medicine.



WEIGHTLESS BUBBLES, suspended in the water, are caught by camera (below). Because this is a still photo, you can't tell whether the bubbles are suspended, but movie proves it.



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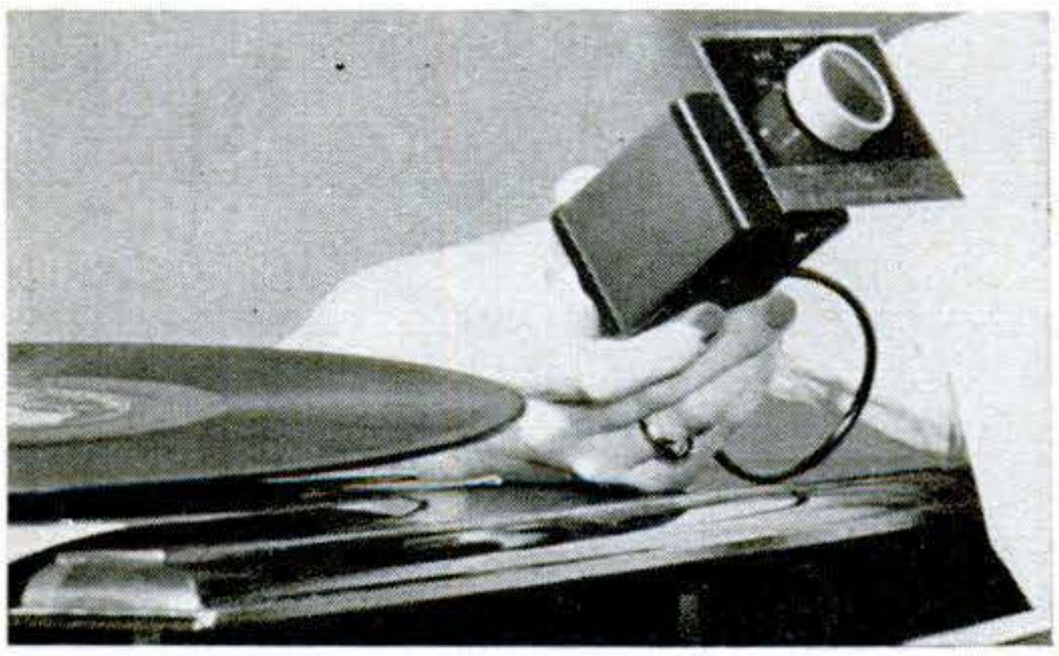
More Muscles for New Tractor

THIS new '53 Ford tractor works harder as the going gets tougher. Extra power from its four-cylinder engine is automatically supplied as needed by a hydraulic transmission to either the driving wheels or an implement attached to the tractor.



Control Cuts Record Scratch

HOOKED to a phonograph, this control lets you hear an early Caruso recording without listening to a lot of surface noise. It compensates for scratched and worn surfaces on old or modern disks. The unit connects between the pickup cartridge and the phonograph preamplifier. It has a control to vary the amount of compensation and will work on all records. GE makes it for use with its pickup cartridge.

Hitches Plane Ride

THE long-haul trailer at top above can hitch a ride and go by air. It nestles into an XC-120 Pack Plane as shown in the bottom photo. On the road, front and rear doors are folded flat; for flight, the doors are opened and locked in a modified V shape to cut air resistance. After the cargo pod is attached, its wheels and tow bar can be removed and stowed inside the trailer. Both cargo pod and plane were designed by Fairchild.

They Say Now.....

"It is not unreasonable to imagine that our life span may be doubled or tripled."—JEAN ROSTAND, FRENCH BIOLOGIST.

"The curve of discovery has been rising for centuries and there is no sign of any flattening out or decline."—MAX COSYNS, PHYSICIST, FREE UNIVERSITY OF BRUSSELS.

"I sincerely believe that we are still near the dawn of our technical development."—L. B. BELLAMY, PRESIDENT, AMERICAN SOCIETY OF TOOL ENGINEERS.

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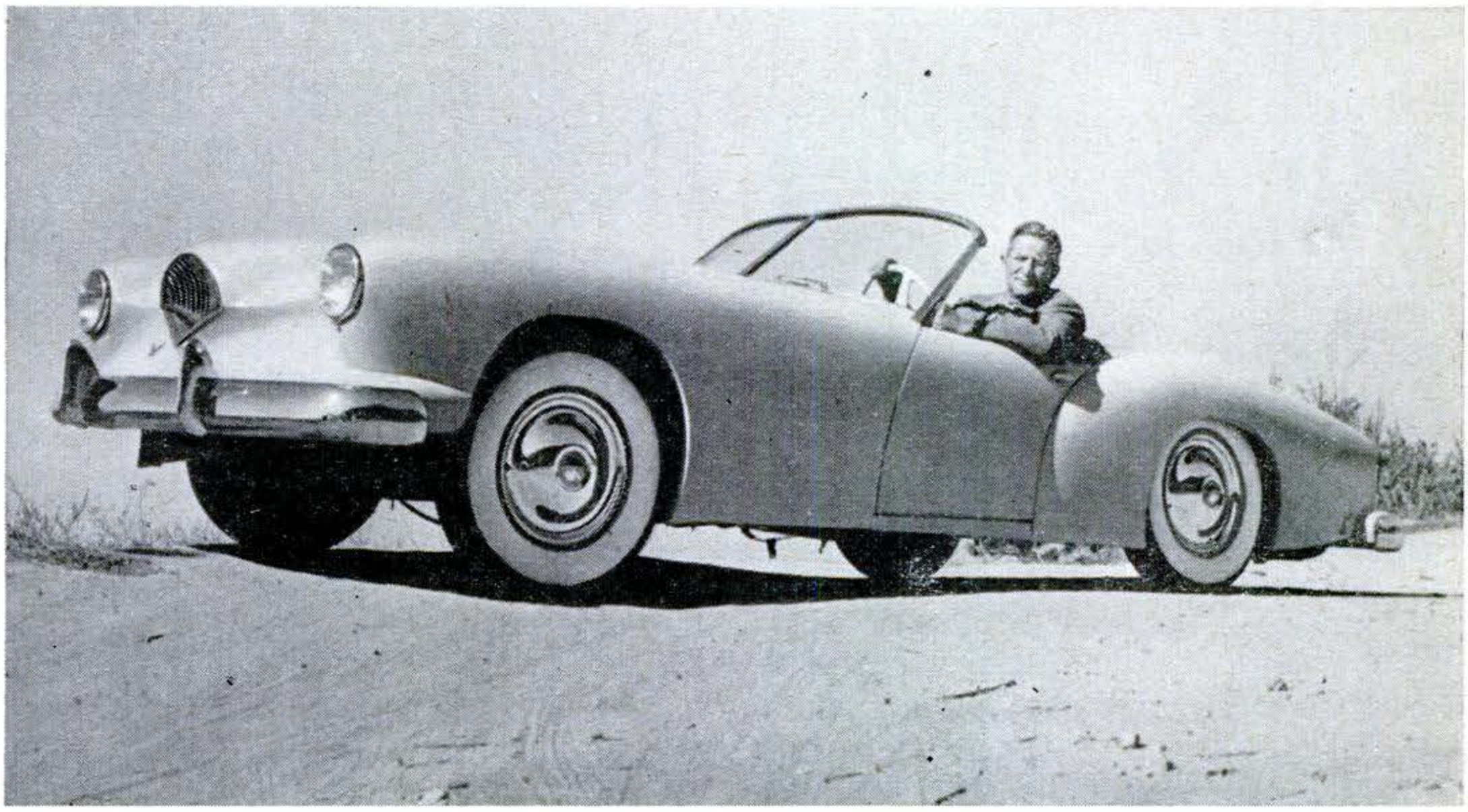
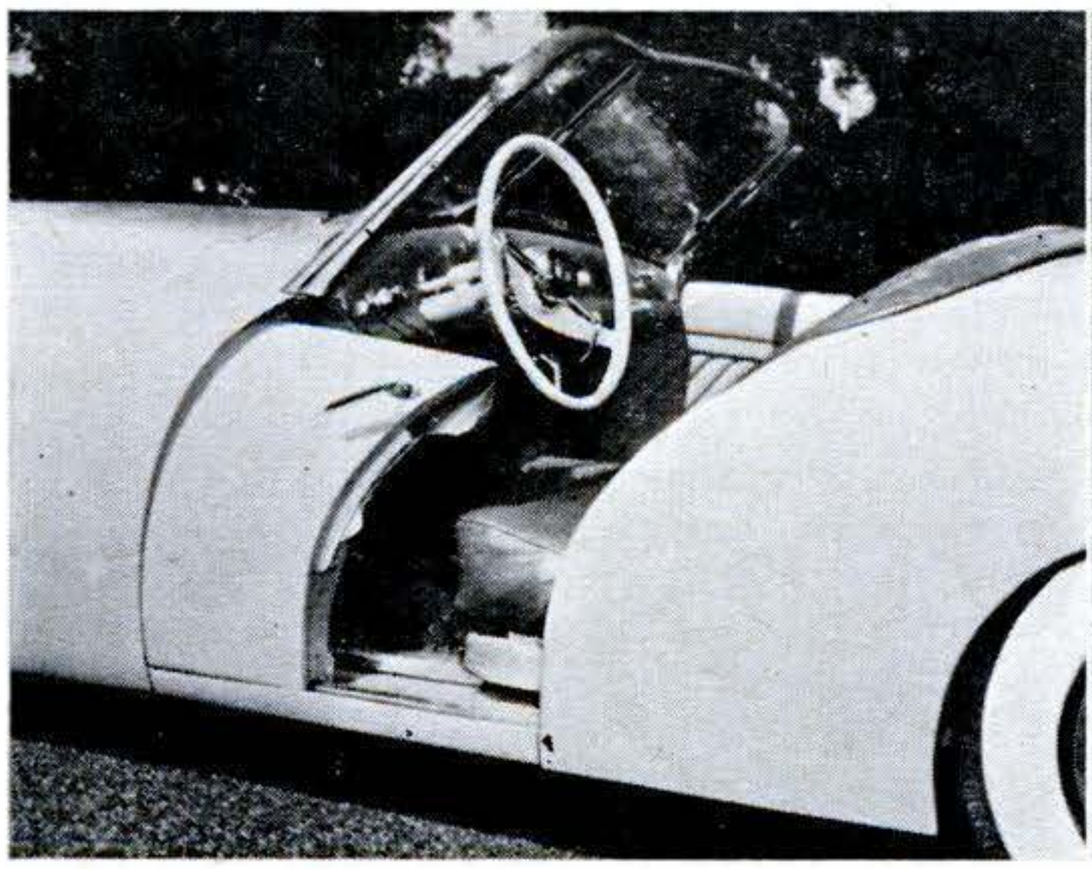
Kaiser Plans Plastic-Body Henry J

THE first plastic-body automobile to be produced in any quantity—a two-seater Henry J sports car styled by Howard Darrin of Hollywood—will make its appearance this year. Kaiser-Frazer plans to make 1,000. Price? Guesses range from $2,500 up.

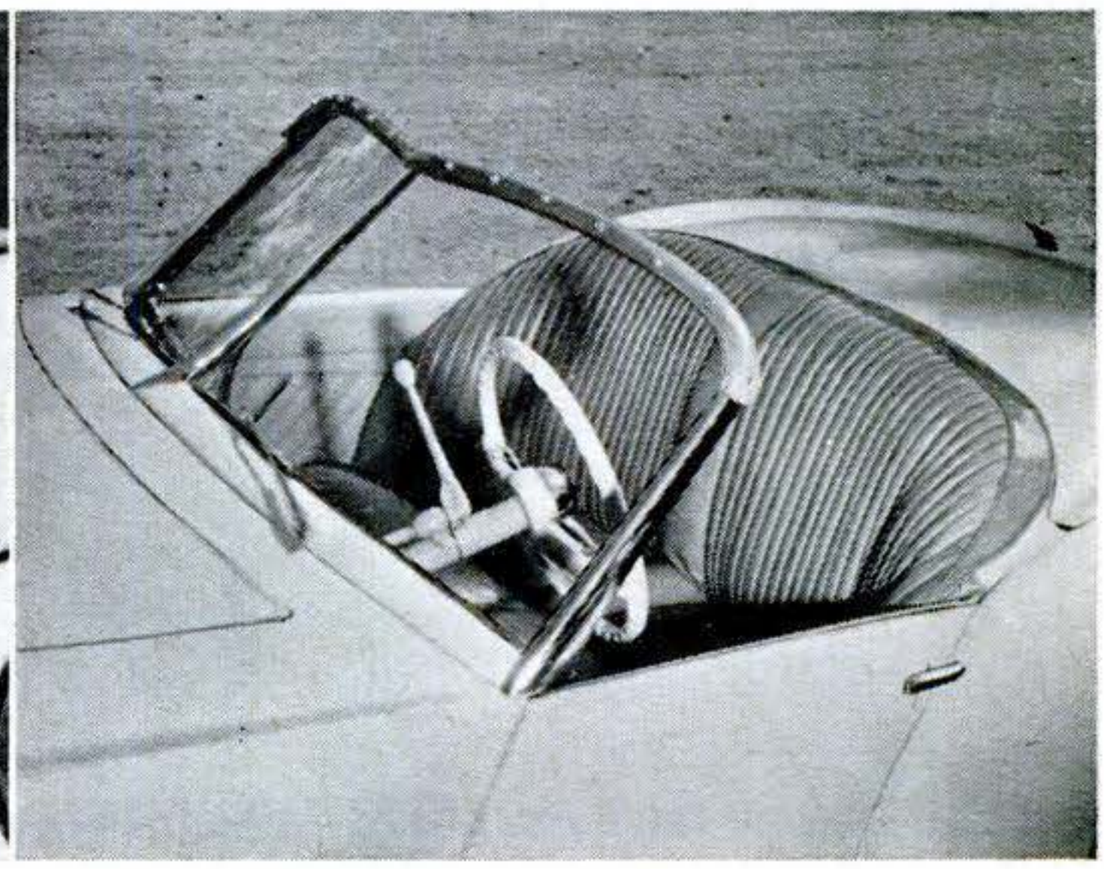
The use of plastic, reinforced by Fiberglas, reduces the body weight 300 pounds under that of a metal car. There are two luggage compartments, one under the hood. Both hood and trunk are opened by knobs on the dash. The convertible top—also push-button controlled—folds neatly into the rear luggage compartment.



RECOGNIZE THIS CAR as a Henry J? New plastic body with glass-fiber reinforcement stands only 34 inches high to top of windshield. Bottom of door is lower than curb height.



SLIDING DOORS are car's outstanding feature. Touch a button and an electric motor pulls door forward inside front fender panel. Motor does double duty—it raises, lowers windows.



SEAT IS TRIMMED to match or contrast with paint job to suit customer. Curved two-piece windshield extends back to door line. A six-cylinder, 65-hp. engine powers the car.

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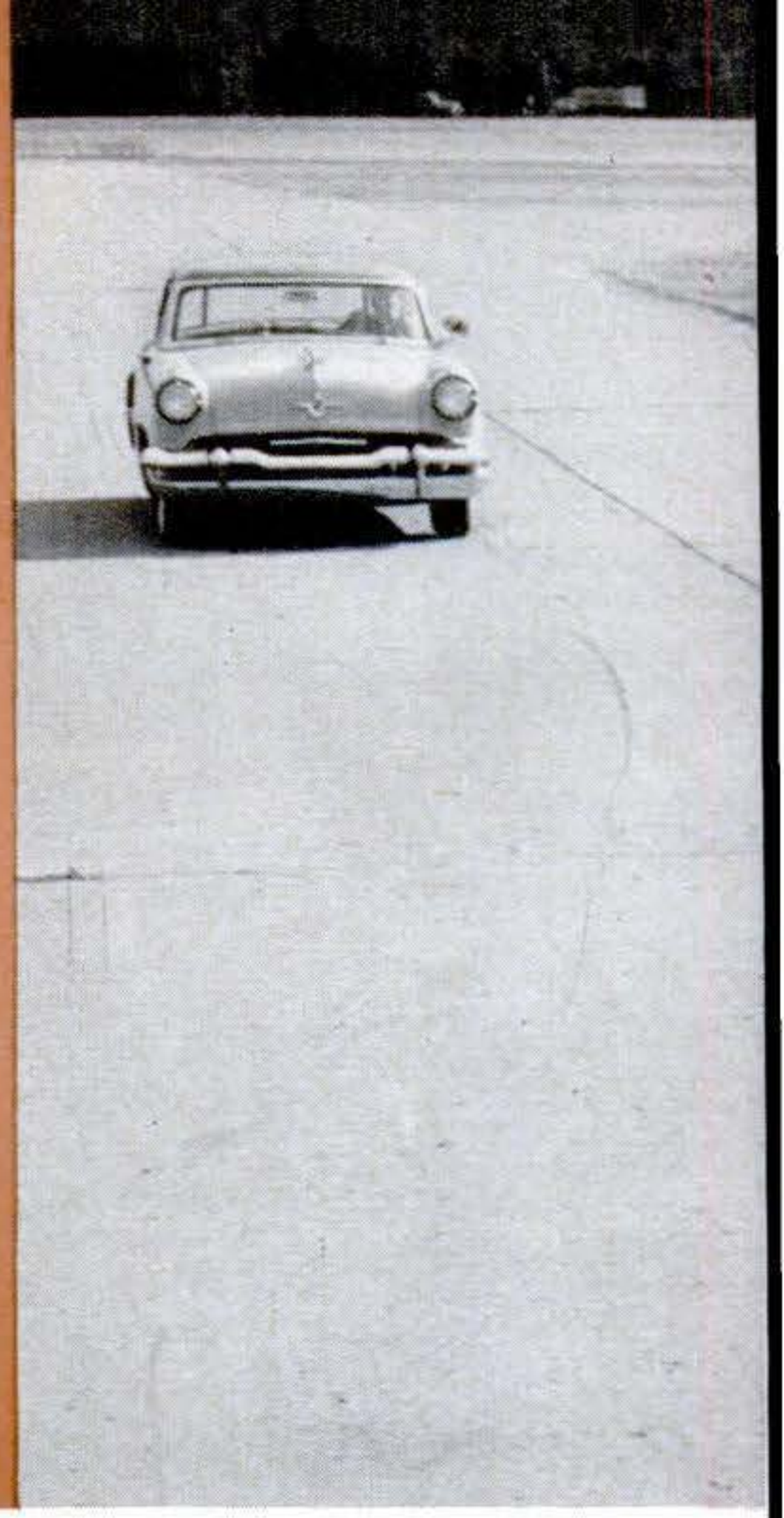
WILBUR SHAW REPORTS FROM THE DRIVER'S SEAT:

Lincoln Forges Ahead in Horsepower Race



Its whopping-big 205 horsepower, squeezed out of the same basic engine, now make this the hottest mass-produced car in the world.

I'VE just driven the world's most powerful high-production automobile. It has 205 horsepower, a take-off that will scare the pants off you, and a reserve of sass even at 75 miles an hour that will overtake anything else on the road.

It has averaged almost 115 miles an hour for 100 miles of steady running. It will accelerate from a standing start to 60 in 12 seconds. It will top 80 in 22 seconds. That's the 1953 Lincoln.

It's no wonder Lincolns were first, second, third and fourth in the stock-car division of the Mexican Road Race—a tremendous tribute to their power and handleability.

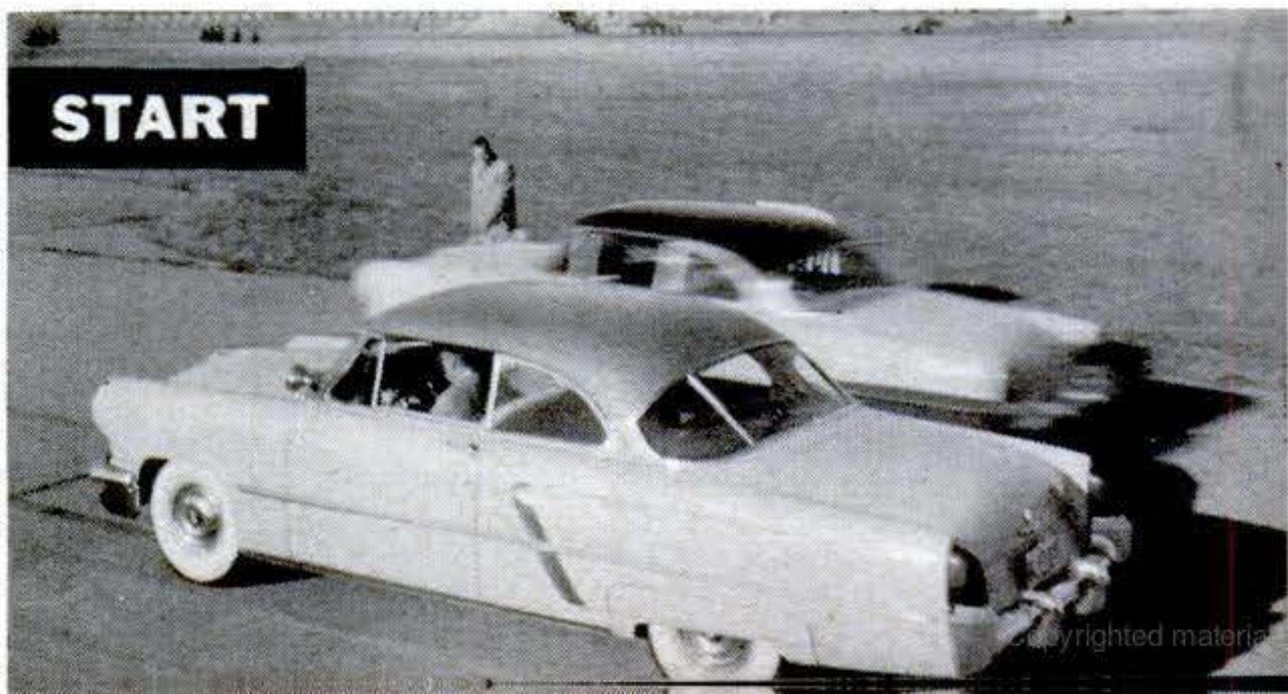
And there's a lot more. It has all the new doodads being put on the luxury cars—including power steering and power brakes. It has an optional trick seat that goes up and down and back and forth by motors. It has, naturally, an automatic transmission.

Basically, the new Lincoln is only a refined version of last year's car. Even the engine is essentially the same. They've just coaxed more power out of it. How they did it is a story with double interest because one change reflects a squabble among Detroit car manufacturers.

How did they boost horsepower from 160 in 1952 to 205 in 1953—the biggest gain without an increase in displacement in the history of the industry?

Well, that takes some explaining. I

THE ACCELERATION of the new Lincoln compared with that of the '52 was evident a second after the starter dropped the flag in this demonstration. The '53 car is in background.



paid a visit to Ford's test track at Dearborn, drove the car, and talked to some of the engineers who wrought the changes. Those changes are subtle, but they add up to performance.

To dramatize that, I got behind the wheel of a new Lincoln idling on a straightaway in the infield. Five feet to my left was a 1952 Lincoln, exactly abreast. A starter dropped a flag. The driver of the other car and I hit our accelerators at the same instant. The accompanying pictures tell the story. If he'd been anchored, I couldn't have left him much faster.

You can sum up the reason for this spectacular performance by saying that

THE OLD LINCOLN had gone exactly 500 feet—or 1½ city blocks—when the new one had pulled 135 feet ahead. Compression ratio has been upped from 7.5 to 8 to 1.

POWER CONTROLS for front seats were inevitable—women go for such things. Two little electric motors in '53 Lincoln move seat 4¼ inches fore and aft, 1½ inches vertically.

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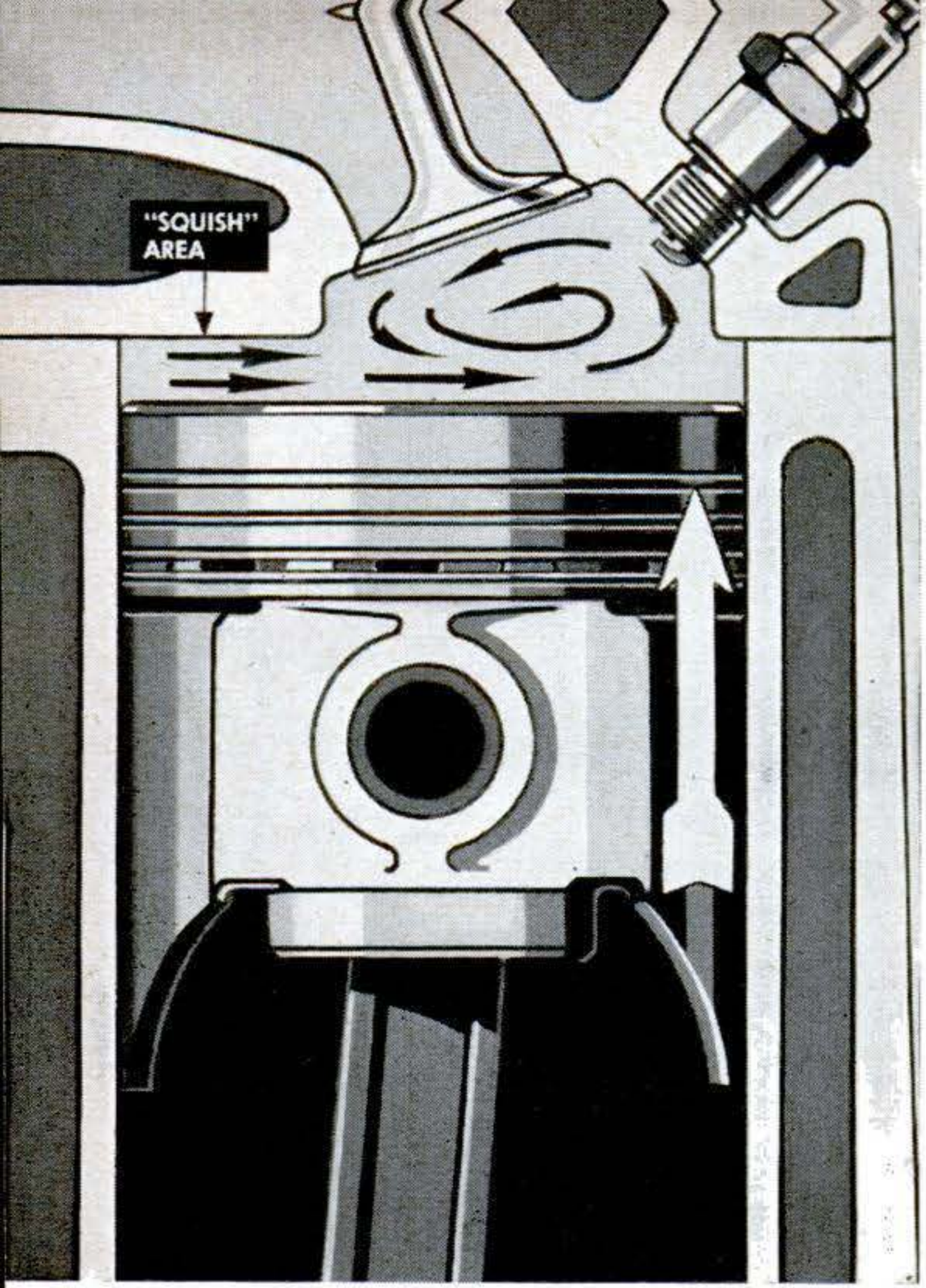

THIS DIAGRAM shows how the piston on the compression stroke causes turbulence in the gas-air charge by "squishing" it at jet velocities out of a low-roofed portion of chamber.

Lincoln improved the breathing of its engine. A gasoline engine is a "hot-air engine." It pumps air, like the human lungs. And, like the lungs, it doesn't do so well when its breathing is restricted.

You don't do so well when you've got a cold, do you?

The first thing they did to the new Lincoln was enlarge the intake valve. (It's a lot harder to get a gas-air charge into the cylinders than it is to get the burned gas out.) Last year the valve had a diameter of about 1¾ inches. Now its diameter is almost two inches. Then they increased the distance that the valve is lifted off its seat by the camshaft by about 3/128 inch. That doesn't sound like much, but it's part of the difference between that cold in your head and free breathing.

Engine Winds Up Faster

They replaced their old two-barrel carburetor with one having four barrels —that lets more air get into the intake manifold and the cylinders. They put a linkage on the distributor to advance the spark mechanically as you step on the accelerator from a dead stop.

They changed the rear-axle ratio to let the engine wind up faster—and that makes the engine operate at a more efficient part of its power curve. They engineered in a higher compression ratio—highest in the industry—for additional power and better combustion.

Finally, they changed the shape of the combustion chamber. And right there is where the squabble among the manufacturers occurs.

Engineers are always working to encourage progressive burning of the fuel-

FACTS ON '53 LINCOLN

Model: Lincoln Cosmopolitan Custom 4-door sedan.

Engine: V-8 overhead valve; 205 hp. at 4,000 r.p.m.; compression ratio, 8:1; piston displacement, 317.5 cu. in.; piston travel (in feet per car mile at 20 m.p.h.), 1,379; bore and stroke, 3.8" by 3.5"; crankshaft bearing surface, 43.49 sq. in.; torque, 305 lb.-ft. at 2,000 r.p.m.

Weight: 4,262 lb.; per hp., 20.79 lb.

Transmission: Hydra-Matic; rear-axle ratio, 3.31:1.

Steering ratio: 26.1:1; radius of turning circle, 22.7 ft.

Effective brake-lining area: 202.3 sq. in.

Springs: front, ball-joint individual coil; rear, semi-elliptic.

Outside dimensions: height, 62.7"; overall length, with bumpers and guards, 214.1"; width, 77.5"; wheelbase, 123"; overhang, front 38.3", rear 52.8"; tread, front 58.5", rear 58.5".

Inside dimensions: seat-cushion width, front 62.3", rear 62.1"; leg room, front 44.3", rear 42.8"; headroom, front 35.5", rear 34.7"; seat height, front 13.3", rear 12.5"; vertical distance, steering wheel to seat cushion, with seat in rear-position, 4.9"; front-seat adjustment, horizontal 4¼", vertical 1½".

Tire size: 8.00 by 15 super balloon.

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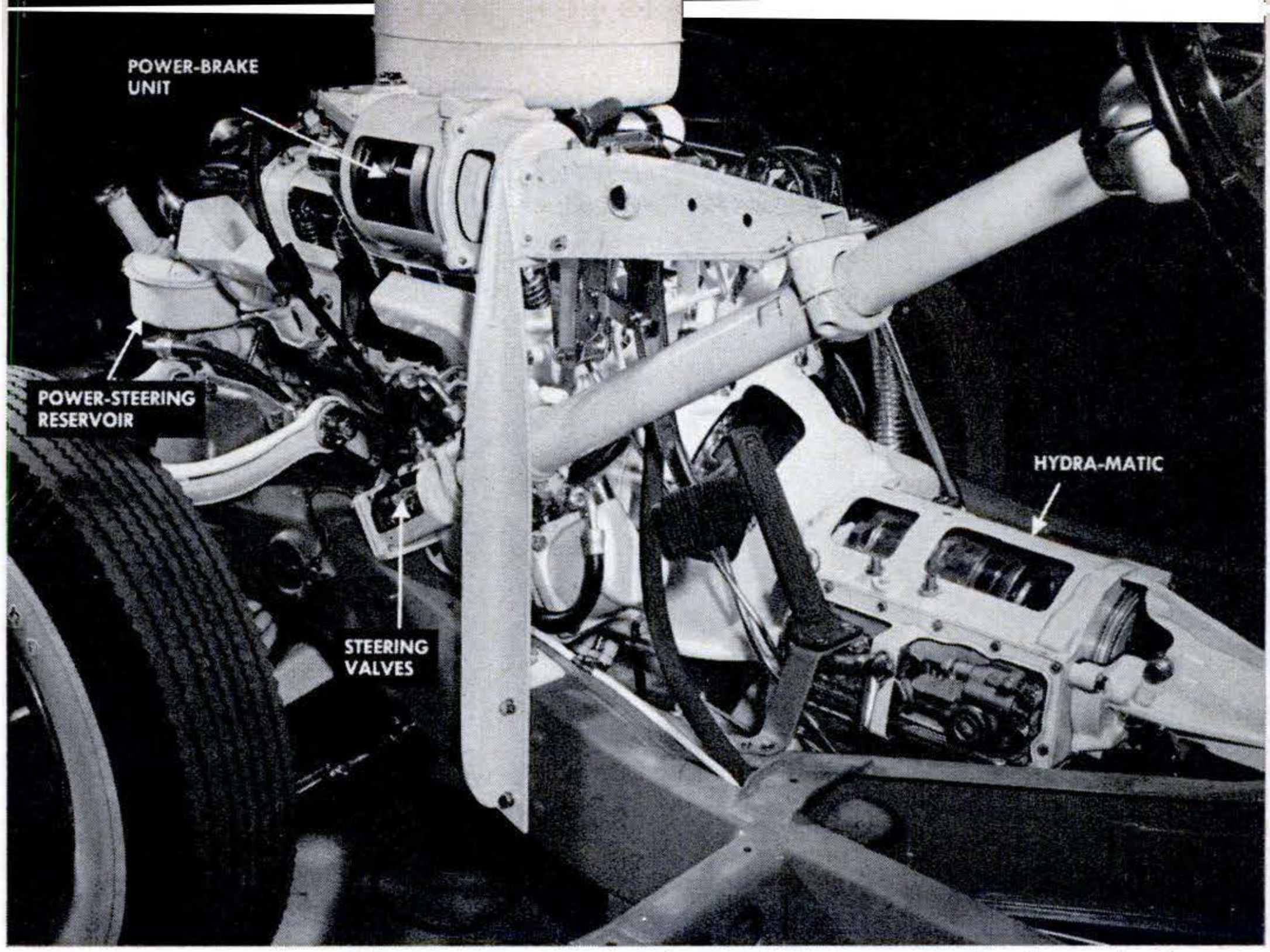

HERE'S THE NEW CHASSIS. The power steering reduces the steering-wheel pull in parking from 42 to seven pounds. Power braking requires about a third less pedal pressure.

air charge in automobile cylinders. You can't get the power out of your gasoline unless the charge burns progressively or gradually, like a piece of wood in a fireplace. The only difference between a charge in a cylinder and the firewood is the time it takes for combustion.

Auto Makers Disagree

If the gas-air charge doesn't burn as it should, you get detonation or "ping." That means the charge ignites in more than one place. The spark plug starts it burning, and then perhaps compression or radiant heat resulting from the initial combustion, or the combination of both, causes the rest of the charge to ignite prematurely. That sets up pressure patterns fighting each other in the cylinder head.

Result: ping. Result: loss of power.

You'll remember that when Chrysler brought out its hemispherical combustion chamber (PSM, Mar. '51, p. 134)—now in the DeSoto and Dodge, too—the reason given was to improve the combustion.

Chrysler put its spark plug at the apex of the hemisphere so that the flame would spread from it like a wave when a pebble is dropped into a pool of water.

The Ford Motor Co. and General Motors, among others, don't agree with this attack on the ping problem. They contend that for best combustion at both high and low speeds, the shape of the combustion chamber is important mostly to create a tornado. The shape sets up a whirling movement in the gas-air charge just before ignition.

Gas and Air Must Thoroughly Mix

They argue that a smooth, hemispherical head "stratifies" the charge at low speeds—that the vaporized gas and air, not mixed properly in the carburetor and manifold, tend to lie in layers in the top of the cylinder. That, they say, results in incomplete combustion or, if not that, creates the need for a richer mixture to get good combustion.

So they shape the head to cause high turbulence and mix the gas and air thoroughly. That, say the Ford and GM

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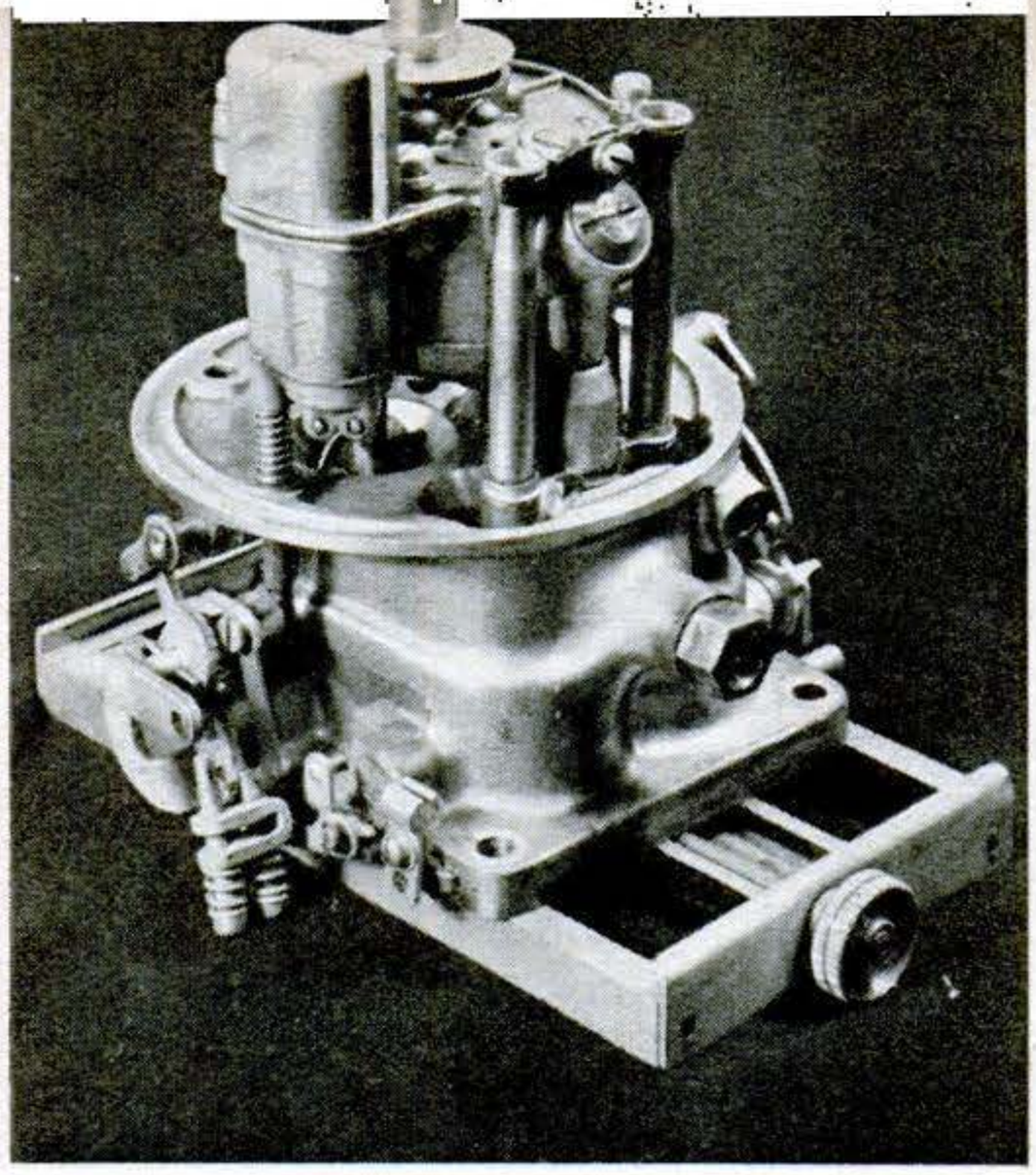


FOUR-BARREL CARBURETOR, unlike any other in the industry, has a float bowl that sits on top on stilts. This is to insulate it from engine heat and prevent "vapor-lock stall."

engineers, insures progressive burning at all engine speeds, and that's what the Lincoln people have done.

More Power on Less Fuel

They must have done pretty well—the new engine uses less fuel for each horsepower produced than the old one. Only a pittance of the fresh performance is attributed to the increase in compression.

They've done other things. By opening up obstructions in the exhaust system, they have reduced back pressures in the engine. It "exhales" more easily. They incorporated an adjustable fast idle when this powerful engine is on automatic choke to accommodate winter temperatures in either Florida or Minnesota.

The new Lincoln astonished me. But I've begun to look on these ever higher and higher horsepowers with mixed feelings. Detroit now has a race on. Cadillac started it. Chrysler caught up and passed Cadillac. Lincoln has forged ahead of both. Cars in the lower price ranges are following.

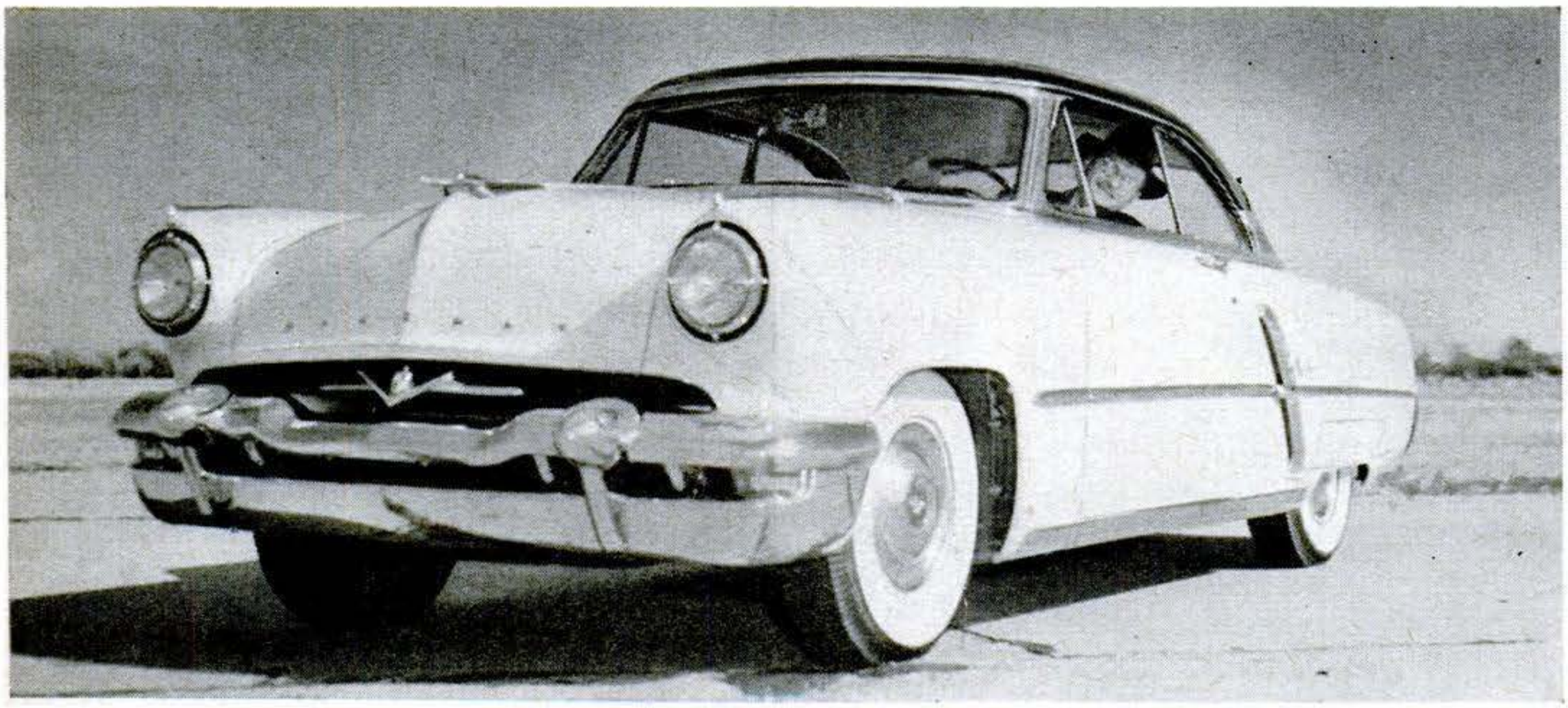
Faster Cars Need Better Drivers

It wouldn't surprise me if Cadillac, still at 190 horsepower as this is written, tops even Lincoln's 205 for '53.

The only real reason for higher horsepowers is performance in the higher speed ranges. The actual horsepower required to propel a 4,000-pound car at 30 miles an hour is ridiculously little—about seven horsepower. Any additional power developed by the engine at that speed is consumed by its own friction.

I like horsepower. I like performance. I like speed in moderation. But I also like safe highways. I suspect that presently Detroit will have to put a limit on these climbing horsepowers.

The only alternative to that is teaching motorists that under their accelerator pedals is something with a dual personality—servant and monster. END



Lincoln's styling is not much changed from last year—but, boy, when you step on the gas!

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Most obvious change in '53 Ford is new grille. Other body lines are about same as last year.

Ford Takes Thump Out of Bumps

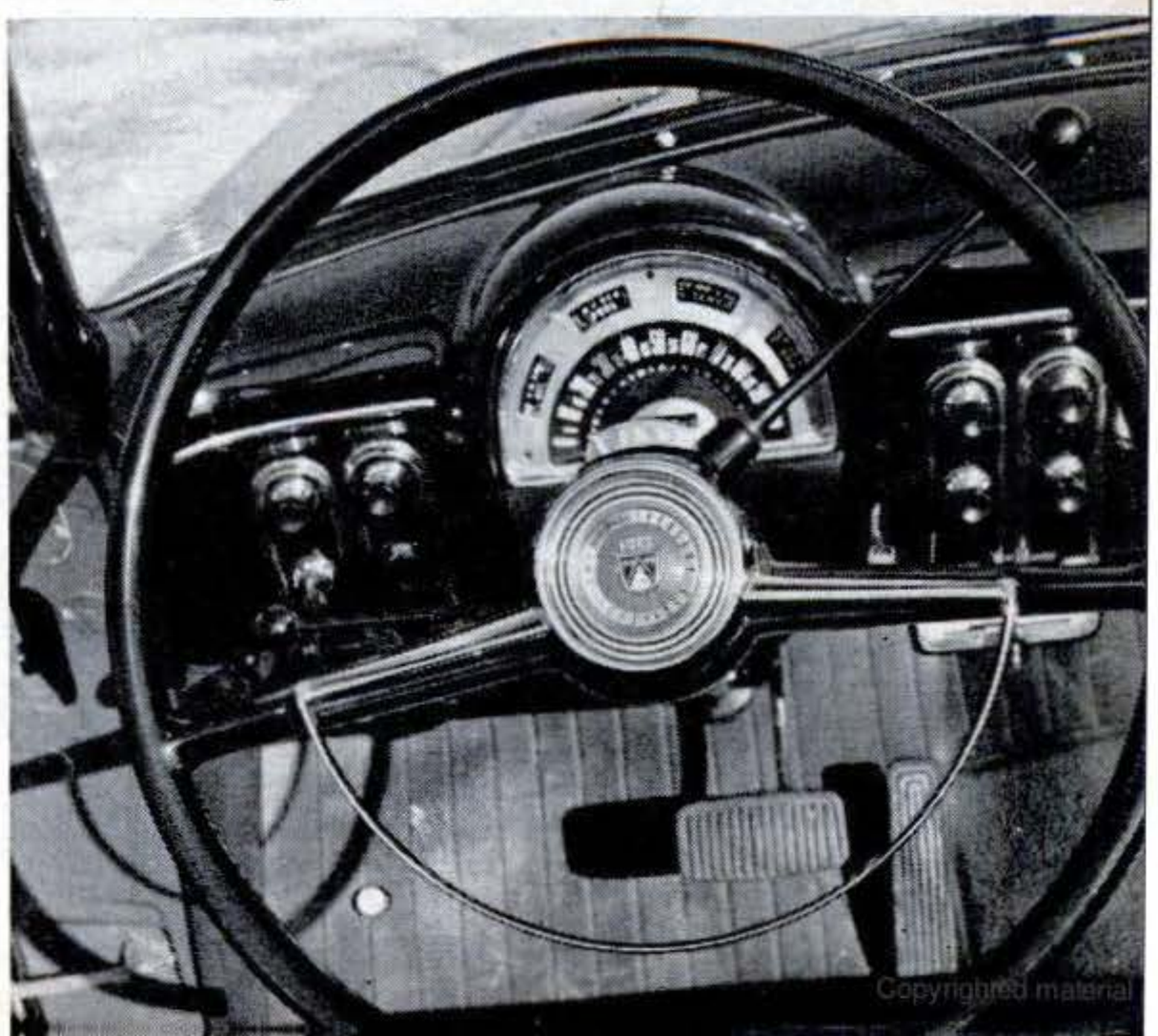
In the 1953 models the brunt of the jolts is taken by the springs and shock absorbers instead of by the body of the car and you.

IF SOMEBODY blindfolded you and took you for a ride in a 1953 Ford over a rough road, you would never recognize the car.

The thump and bump when the wheels hit chuck holes are gone. The ride is "flatter," as the engineers say. The springs and shock absorbers take the jolts without transmitting them to the body of the car and the passengers.

Most of the jars that put your teeth on edge in motoring come from "strike through" or "bottoming." For a second, it's just as though you had no springs at all. The road shocks hit the body like

CHANGES IN INSTRUMENT PANEL include easier-to-read needles on speedometer, ammeter, and gas, oil-temperature and pressure gauges. New moldings surround control buttons.



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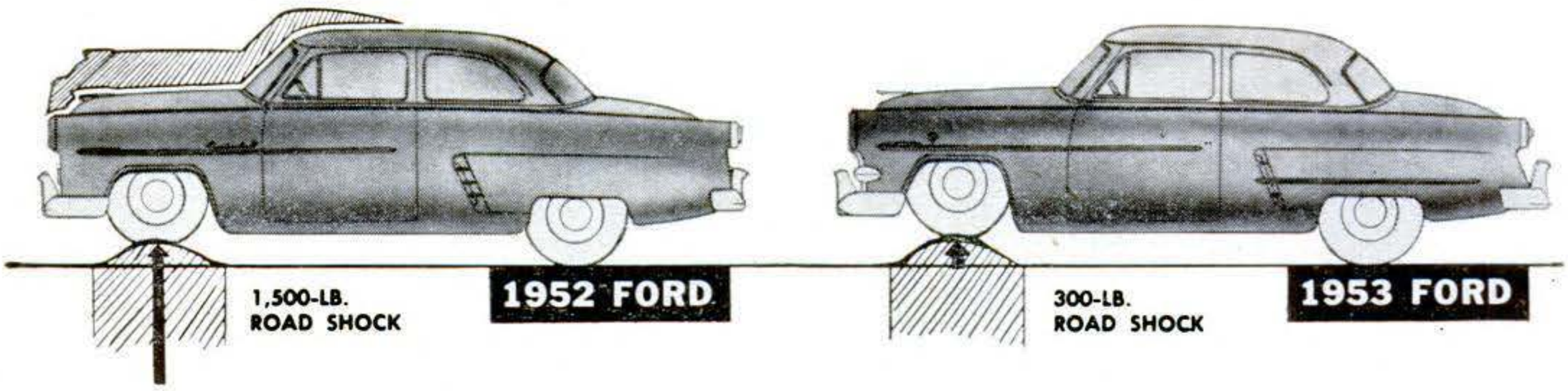
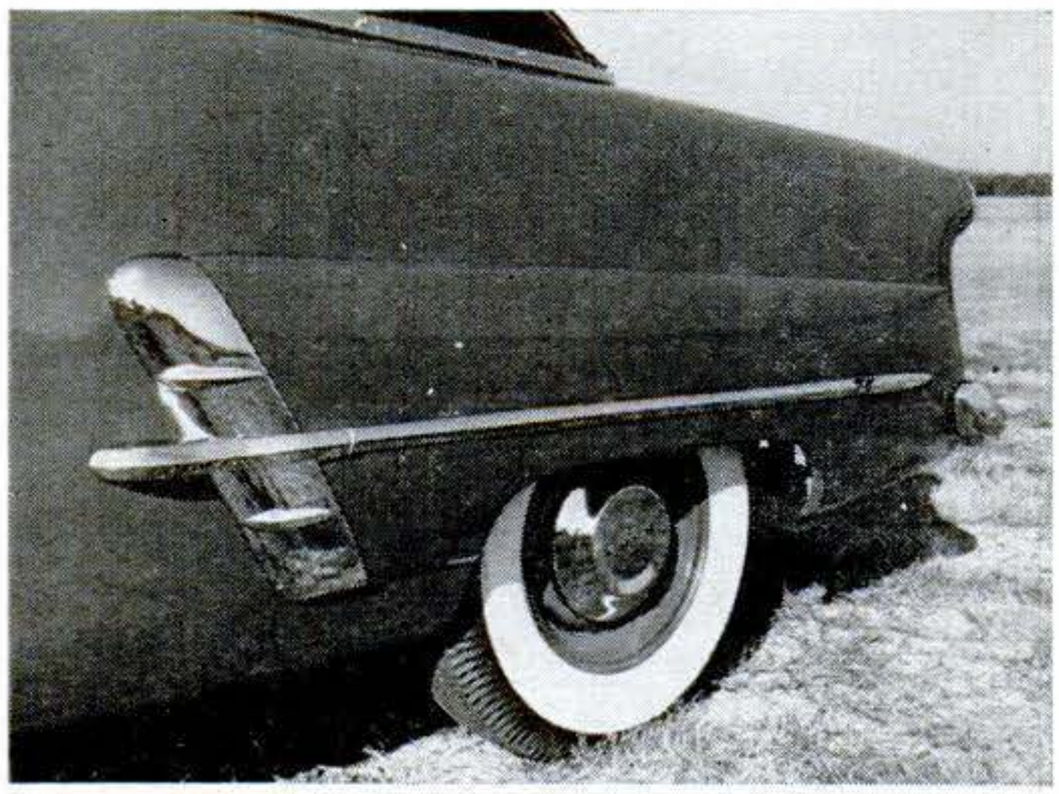


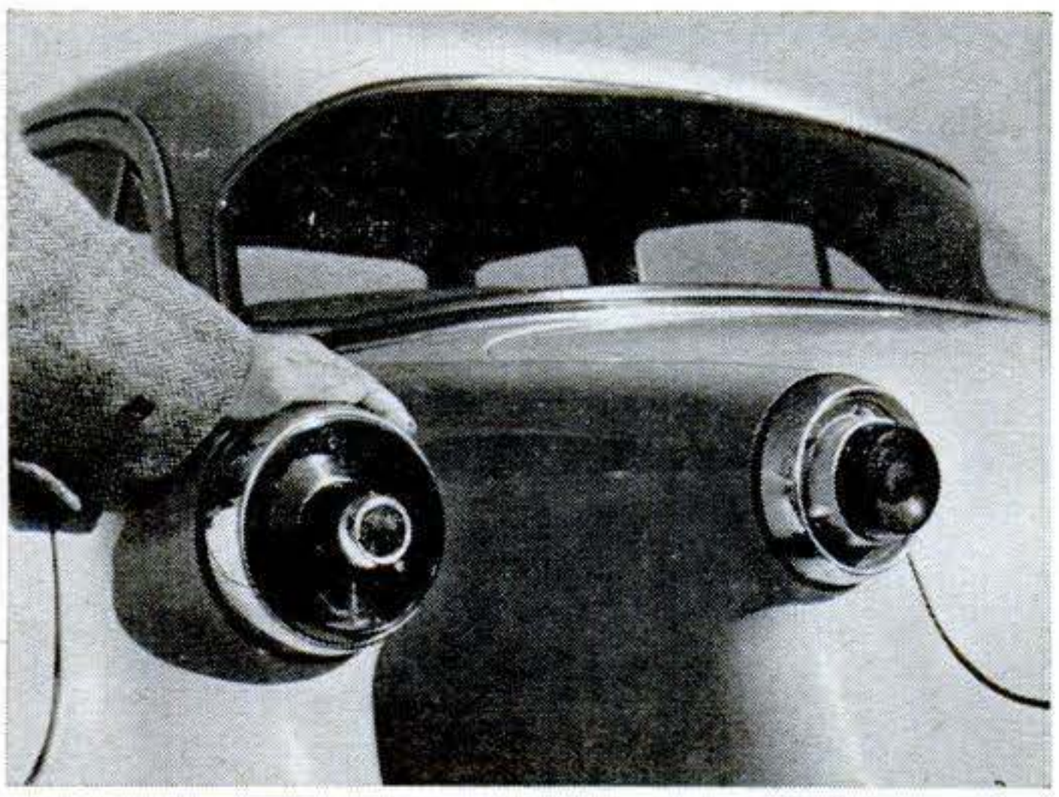
ROAD SHOCK IS REDUCED 80 percent, Ford claims, by changes in springs, shock absorbers and wheel travel. Drawings show how 1,500 pounds of shock transmitted by a bump to frame and body of 1952 car is reduced to only 300 pounds in 1953 models.

sledge hammers. The car hits a bad bump, the springs flex and the rubber strike pads on the suspension bang against the frame.

A number of little alterations make the difference in the new Ford's ride. The amount of up-and-down travel allowed the front wheels before the strike pads hit the frame is doubled. The travel distance for the front and rear wheels is now about the same. More flexible pads absorb more jounce. A different gauge of spring leaf is used on the semi-elliptics in the rear for softness.



MODERNISTIC REAR FENDER is speared by a chrome strip across wheel cutout. Up front, added wheel travel necessitated addition of skid plate to protect engine oil pan.



JET-TYPE TAIL LIGHTS for '53 have projecting centerpiece outlined in chrome (left). The tail light for last year's model is shown on the car at right.

To take care of the added spring softness, the shock absorbers were redesigned. When the springs flex, the shock absorbers snub the movement faster.

In celebration of Ford's half-century of manufacture, the top of the steering column carries a medallion inside a new half-circle horn ring with the words: "50th Anniversary—1903-1953."

"Hooters" Are Eliminated

They have done something else to the new Ford. Last year a car came off the assembly line now and then with an ailment diagnosed technically as resonance. It "hooted." Vibrations started somewhere near the front of the car, created noises and grew in volume as sympathetic vibrations were set up somewhere about midway between the front and rear wheels. The engineering department got a king-size headache looking for the trouble.

One day a research man became aware that when he turned a hard corner in a "hooter" the noise stopped. Hah! He smelled a rat. He filled his oil pan to the brim. That did it. The resonance had been originating in the pan and spreading to the exhaust piping. For '53 there will be no more hooters. The oil pan has been stiffened.—*Devon Francis.*

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New Mercury Looks Longer, Performs Better

LIKE its big sister, the Lincoln, the 1953 Mercury has improved its engine performance by modifications in the exhaust system. A straight-through type of muffler and a two-inch tailpipe reduce exhaust back pressures and let the engine "breathe" more easily. New to Detroit is the Mercury's two-position door check—you can open the door either halfway or all the way and it will stay there. Styling changes include new moldings to make the car look longer.

Willys Introduces Hard-Top Convertible for 1953

A HARD-TOP "convertible" was added last month to the line of Willys six-cylinder cars for 1953. Called the Aero Eagle, it is powered by the same 90-horsepower F-head engine used in the first Willys sedans produced since the end of the war (PSM, Jan. '52, p. 116).

All Willys models feature more rear-seat legroom. A four-door sedan, the Aero Lark, also will be produced.

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Pontiac Adopts New Front Suspension

THE main changes that you can see in the 1953 Pontiac are its one-piece windshield, new grille and chrome treatment. Others include a boost of 16 horsepower in the six, a wheelbase two inches longer, and optional power steering.

A new "curve control" front suspension makes the car handle better on turns and cuts tire wear by reducing the tendency of the front wheels to lean left when directed right and vice versa.

Dodge Borrows from Past to Get Sports-Car Look

ADDED to the 1953 line of Dodge cars (PSM, Nov. '52, p. 123) is the newly announced Diplomat. This model, like others originated by Detroit manufacturers in the last two years, was designed for a sports-car look. The outside spare wheel contributes to the impression. Mounted on a trick locking hinge, it can be tilted back to get at the trunk interior without removal. Wire wheels also are available optionally.

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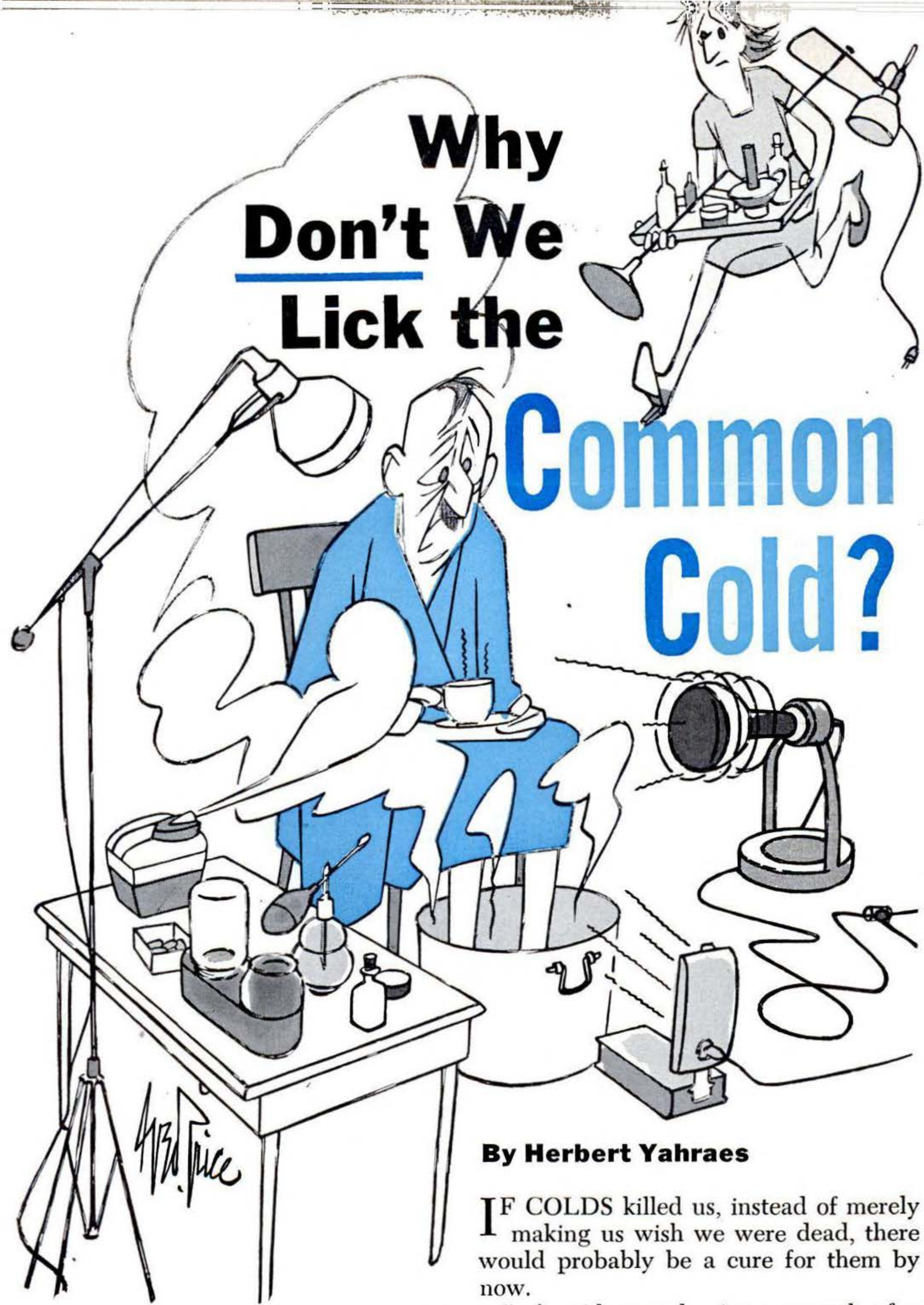
Why Don't We Lick the Common Cold?



We're spending only one-fortieth of a cent per cold to find a way out of our misery—and few scientists are helping us find it.

By Herbert Yahraes

IF COLDS killed us, instead of merely making us wish we were dead, there would probably be a cure for them by now.

Isn't widespread misery enough of a goad to spur medical researchers on to finding a cure? Evidently not.

Colds keep 250,000 workers at home every day of the year, and put thousands more in a class with the walking dead, yet practically nothing is being done

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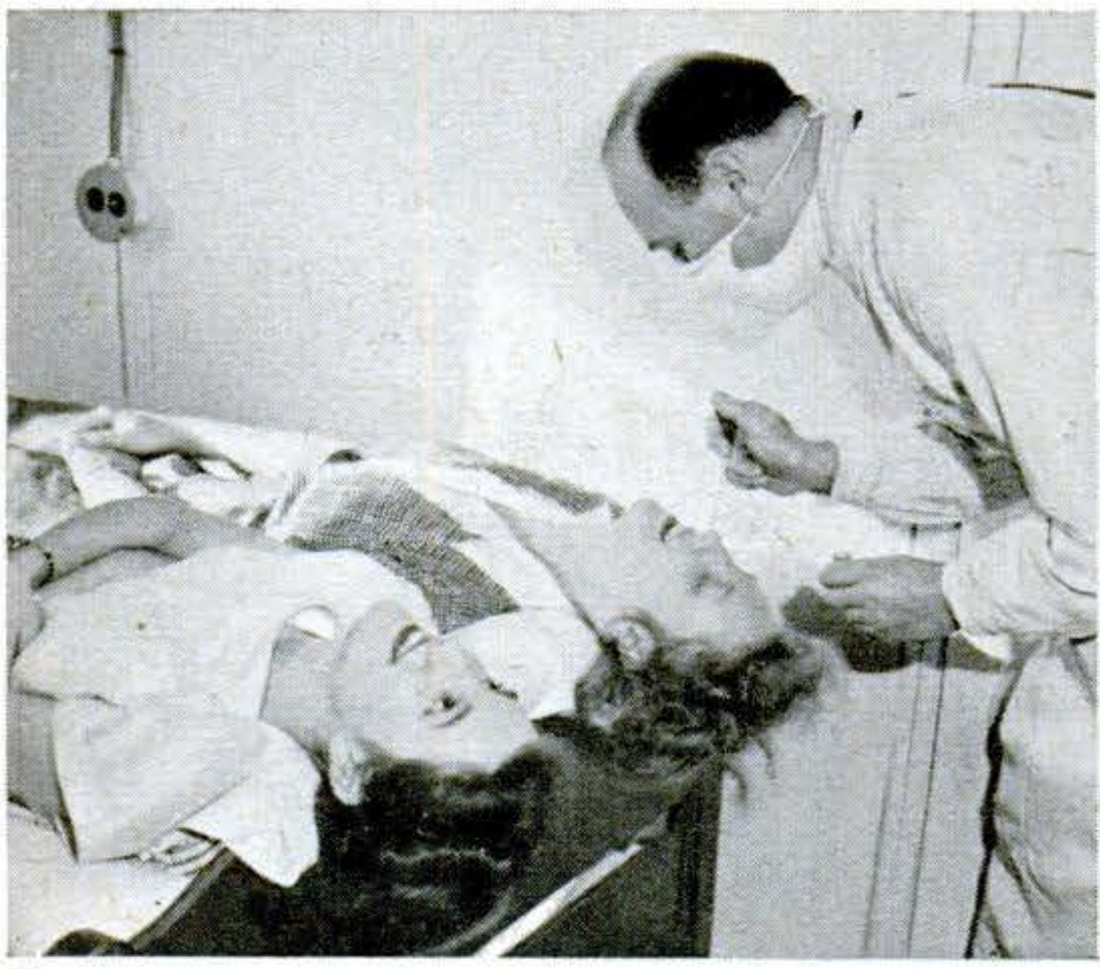
In England You Can Have a Free Vacation If You'll Catch a Cold



1 OFF TO A BAD START, two British volunteers begin a "holiday" paid for by a research clinic. The nose drops contain a cold virus.

2 WAITING FOR SNIFFLES, the girls play chess. Medical staff is masked so as not to get or give colds, which would confuse the tests.

to put an end to them. Colds cost us $400,000,000 a year to treat, yet we are spending only one-fortieth of a cent per cold to discover the cause and stop this huge, unnecessary expenditure.

Colds cost their victims a billion dollars a year in wages and rob us all of four billion dollars' worth of goods and services we might have had if the cold sufferers had been able to keep working.

Doesn't science know anything about what causes colds? Quite a little.

Virus at Work

As long ago as 1914, at least one clue to the mystery was found. That year a German physician, W. H. Kruse, discovered that a filterable virus was at work in a cold victim. He washed out the patient's nose, filtered all identifiable bacteria, and then inserted drops of it in the noses of healthy volunteers. The human guinea pigs came down with colds.

This was evidence that a cold virus existed. If it could be identified and grown in a laboratory, science might learn how to protect people.

Since then, the few scientists interested enough to investigate have found the same thing. They haven't yet been able to identify the virus—or, perhaps, viruses. They don't even agree that the virus is entirely responsible for the cold.

Lack of money doesn't block research on the cause of colds. Dr. Victor H. Haas, of the U. S. Public Health Service, says he doesn't know of a single worthwhile request for research funds that is not being met. Another distinguished doctor declares that "those who wish to do so can always obtain financial grants-in-aid if they are qualified."

It's mostly lack of interest among competent medical sleuths that prevents us from getting rid of colds forever. Colds are drab and unexciting except to people who happen to have them.

Admittedly, though, there are problems involved in cold research. One of the biggest is that the common cold is—well, common. It's easy to trace an outbreak of typhoid fever or smallpox to its source. Trying to track down the origin of a cold is like trying to identify the exact tree from which each fallen leaf on a wind-littered lawn came.

Moreover, what seems to be a cold may be actually a mild attack of influenza, allergic rhinitis, an early stage of measles, chicken pox or polio, the result of inhaling certain fumes or dust, or even a by-product of emotional stress. Many a person catches a "cold" just be-

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3 SOUP'S ON, but it must be left outside the girls' door. They have to be completely isolated from outside sources of infection.

4 THE PAYOFF was anticipated, but it's no fun. Now researchers at least know where the cold came from, can study symptoms.

fore he tackles a new job, takes an exam, hits the boss for a raise or has the highfalutin Joneses in for dinner.

The shifty character of the cold is one of the reasons why "cold cures" seem to work. The cures are often taken for conditions that only look like colds. For example, if you have allergic rhinitis, an antihistamine—most ballyhooed "cold cure" in history—probably will do you some good. If you really have a cold, it probably won't.

Man Is the Guinea Pig

A major roadblock is that there isn't any laboratory animal to help scientists in their experiments. You just can't give a cold to a dog, cat, rat, mouse, guinea pig, hamster, rabbit, squirrel, ferret, pig, hedgehog or monkey. You *can* give a cold to a chimpanzee. Dr. A. R. Dochez, of Columbia University's College of Physicians and Surgeons, proved that in the 1930s. But chimpanzees are expensive, strong, and opposed to being experimented on.

That leaves only man, who is a rather poor lab animal. However, the British have tried using him.

Since 1947, healthy English men and women between the ages of 18 and 50 have been offered a 10-day, expense-free vacation in the cathedral town of Salisbury if they would let medical researchers there try to give them a cold. But very few people think a 10-day vacation at somebody else's expense makes up for catching a cold.

However, one of the British researchers, Dr. C. H. Andrewes, has discovered a useful fact. At least one cold virus is so tiny that it will pass through a filter having pores with a diameter of only 57 millionths of a millimeter. This makes it one of the smallest viruses known.

What's more, this little devil, in nasal fluid from some of Doctor Andrewes' cold sufferers, remains potent after being packed in dry ice for months. But when Doctor Andrewes tried to breed the tiny virus, as Doctor Dochez and his fellow researchers had earlier proved could be done in fertile chicken eggs, he ended up with something that would no longer cause colds. Why? Was it a different kind of virus?

U. S. Public Health Service investigat-

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BREEDING COLD VIRUSES in a U.S. laboratory begins with inoculating fertile eggs with a solution containing a virus. Often—though, mysteriously, not always—they multiply there.

ors five years ago confirmed the Dochez evidence that at least one cold virus can be cultivated. They even made the exciting discovery that they could tell by a chemical test whether or not the virus was present in a fluid. Then, like Doctor Andrewes, they ran into bafflement. After about a year and a half of breeding this particular virus, the strain apparently ran out. At least it would no longer produce colds. To make matters worse, when other scientists tried to use the chemical test on other strains of the cold virus, the test wouldn't work.

Test Shows Promise

A different test, being tried by Dr. Thomas G. Ward at the Johns Hopkins School of Hygiene and Public Health, shows promise. Using radioactive phosphorus, Doctor Ward has found that chick embryos infected with a cold virus seem to take up more of the tagged stuff than embryos with no virus.

Until there is a foolproof test for a cold virus, lab workers are fumbling in the dark. They can't be sure that they have what they want until they drop it into noses and the people come down with colds. Even then, they must be certain that those colds were caused by nose drops and not just colds that the people would have contracted anyway.

Investigators have uncovered interesting facts about colds, which may or may not be related. At least they provide leads. Here are some of them:

- You can't catch cold by standing in a chilling draft, even when you are wearing a wet bathing suit.
- People who live on the arctic island of Spitsbergen have no colds between the departure of the last ship in the fall and the arrival of the first ship in the spring. Then the island is swept by colds.

Children Are Cold Targets

- Small children catch colds more readily from other small children than they do from adults.
- The closer and longer the contact you have with a person who has a cold, the more likely you are to catch it.
- The older you get, the fewer colds you have.
- Families with school children have three times as many colds as families with no school children.

Maybe if all the medical researchers were to come down with bad colds simultaneously, they would suddenly get mad enough to focus their skilled attention on the common cold and lick it.

Meanwhile, we sniffle and snarl. END

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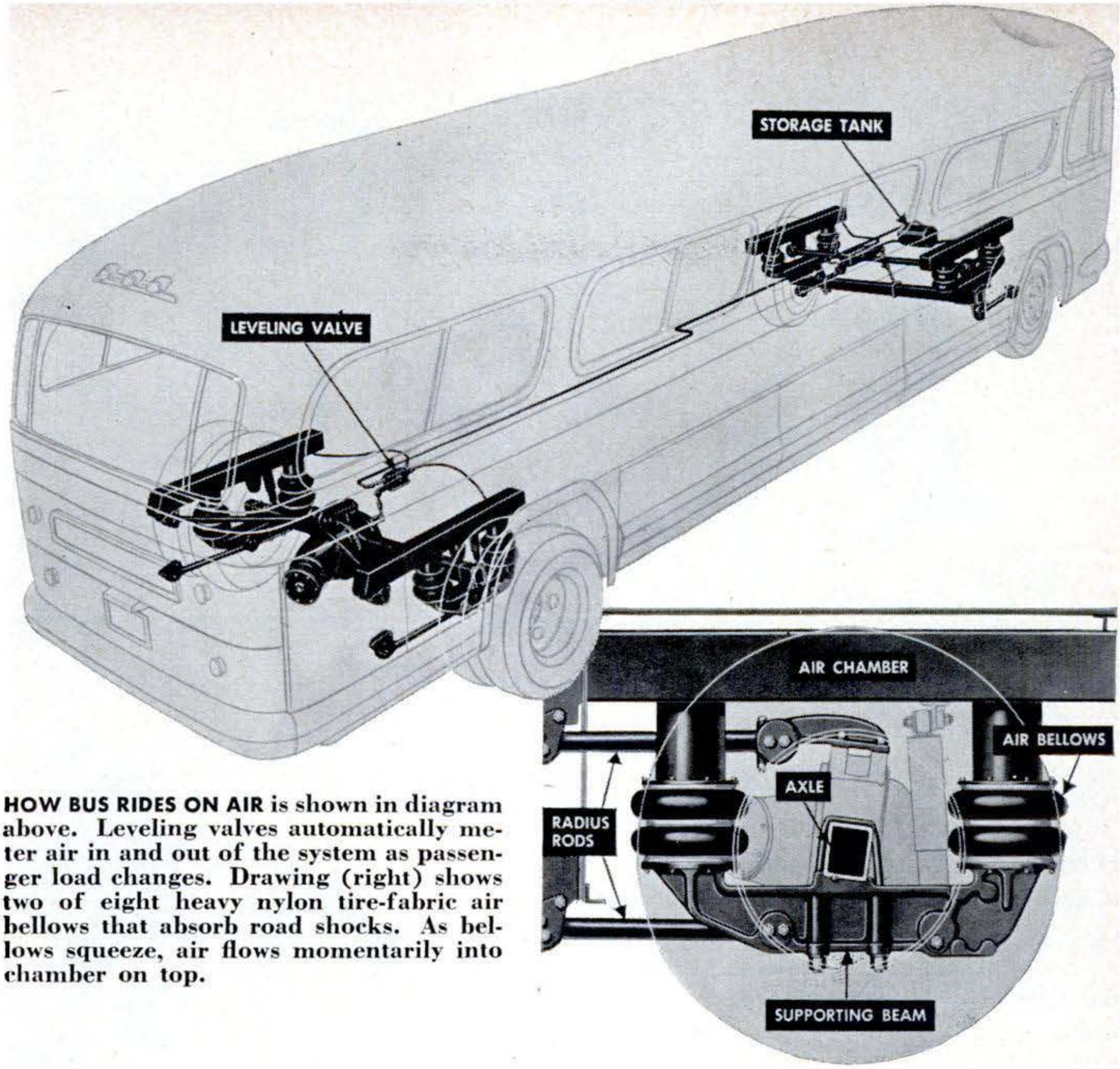
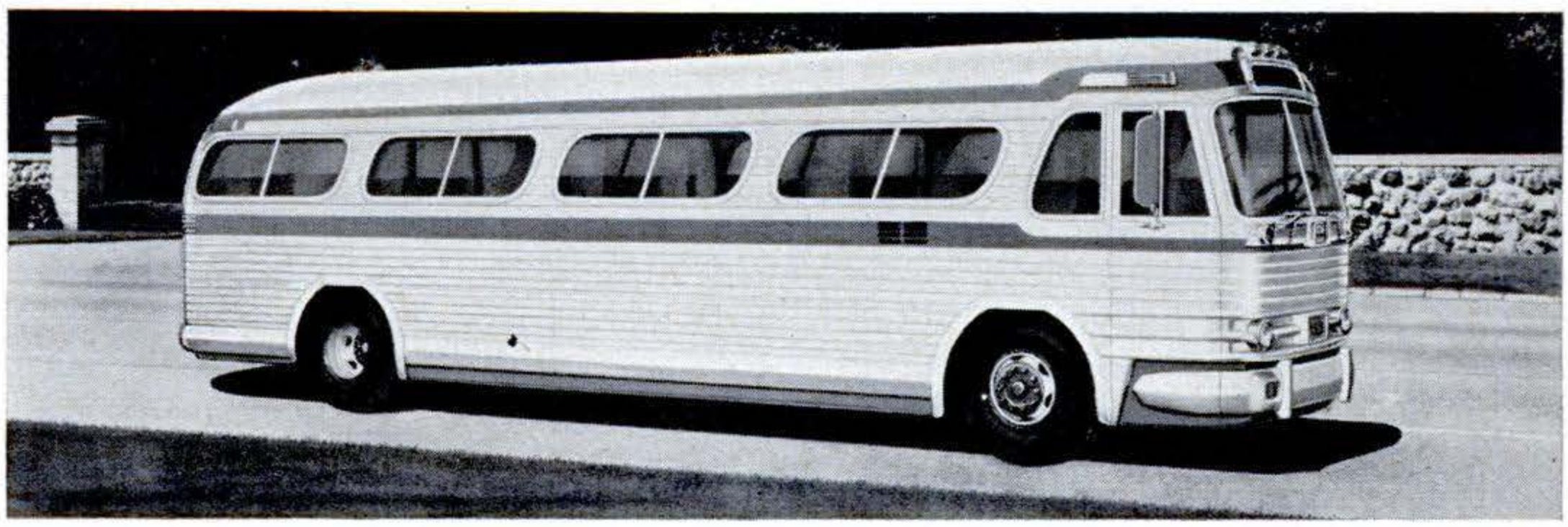


HOW BUS RIDES ON AIR is shown in diagram above. Leveling valves automatically meter air in and out of the system as passenger load changes. Drawing (right) shows two of eight heavy nylon tire-fabric air bellows that absorb road shocks. As bellows squeeze, air flows momentarily into chamber on top.

Air Springs Give Bus a Bumpless Ride

YOU will be literally riding on air when you board a new type of intercity bus just announced. It has no leaf springs at all. In their place are bellows containing nothing but air.

The air absorbs road bumps so perfectly that passengers can read their magazines without a jiggle. Designed and built by the GM Truck & Coach Division, the new suspension system absorbs all types of road shock, from chuck holes to ordinary tire-tread vibrations.



Bus seats 41 passengers behind 72-inch-wide "picture" windows, has over-all length of 35 ft.

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They Make Fortunes by Mail

SPACE HELMET has tubes and collar that are blown up. Clear-plastic dome has wide openings for breathing.

When the public takes to a bright idea it sends millions of dollars through the mails to these smart businessmen.

By Andrew R. Boone

LITTLE did Arthur Godfrey dream, when he began strumming a ukulele on his TV-radio program in New York, that he would give a shot in the arm to an amazing industry 3.000 miles away.

Across the country in Pasadena, Calif., Charles W. Worley heard the Hawaiian strains. Next morning he huddled with his staff. A few weeks later he cradled in his arms a brown-and-cream ukulele all made of plastic.

Worley, like scores of other clever producers of toys, home wares and just plain gimmicks, then boarded the bandwagon to big sales throughout the nation. He operates one of 102 fast-growing companies in the Los Angeles area that cater to the whims and tastes of folks willing to entrust a dime or several dollars to the U. S. mail. The gimmick industry blossomed shortly after the war. Now it's in full flower, making fortunes for enterprising inventors and owners.

Worley started his BW Photo Utilities company to manufacture darkroom and photographic items. He found the market limited. Then he added low-cost novelties that could be sold by mail. Today he's turning out 80 individual offerings, from plastic iced-tea spoons for a nickel to ukes at $3 a copy. Nearly 75,000 units are made in his plant every day.

The men who devise and sell these gadgets and gimmicks necessarily keep their eyes open for a hot idea. A small

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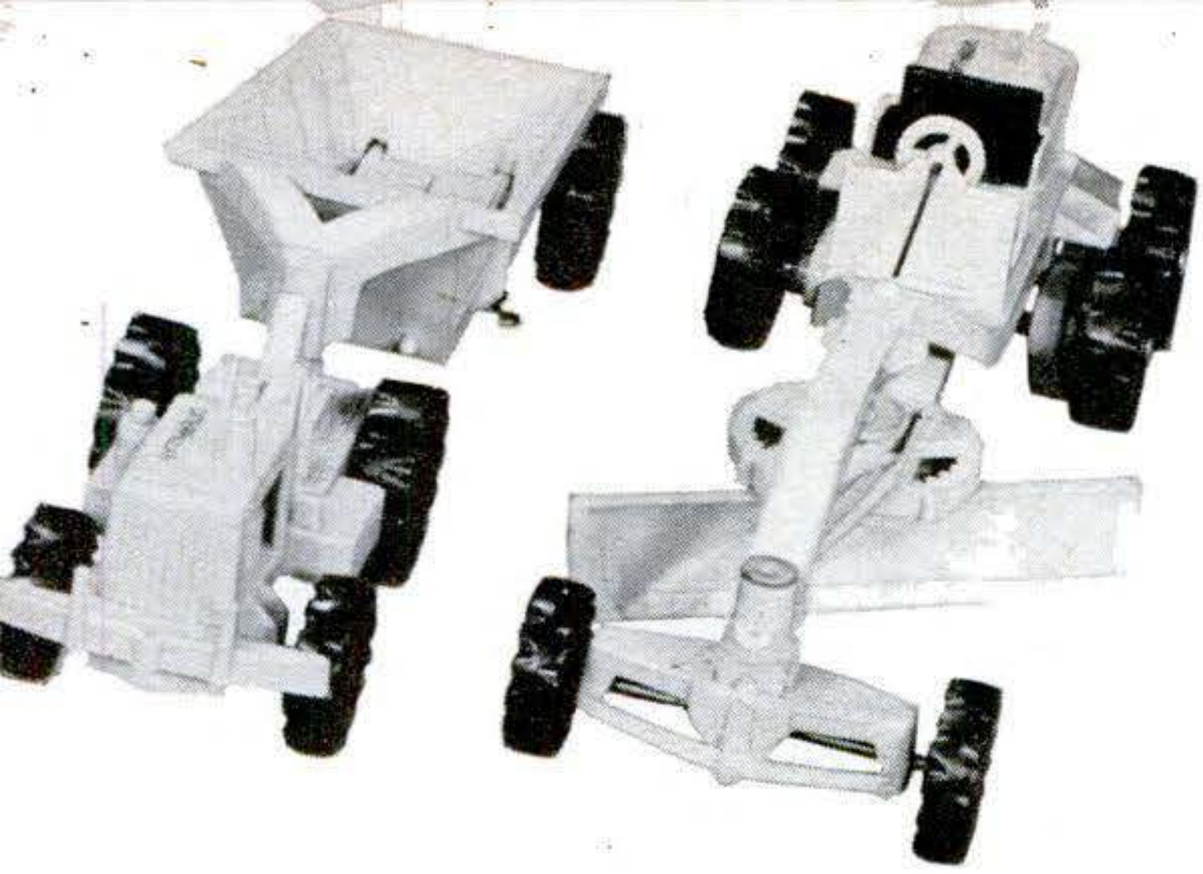
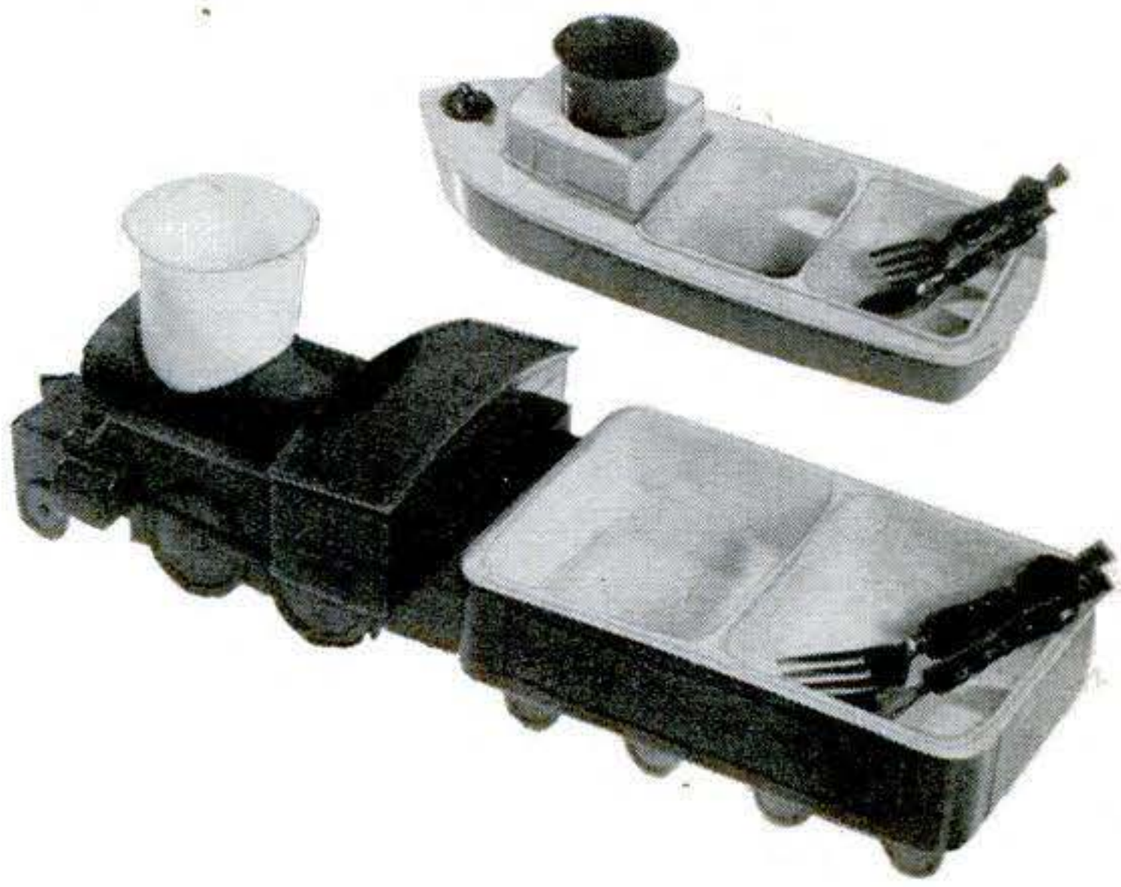


EARTH MOVER AND SCRAPER are made of a tough molding plastic, copy real Caterpillar equipment. A million of them were sold by mail order in eight months.

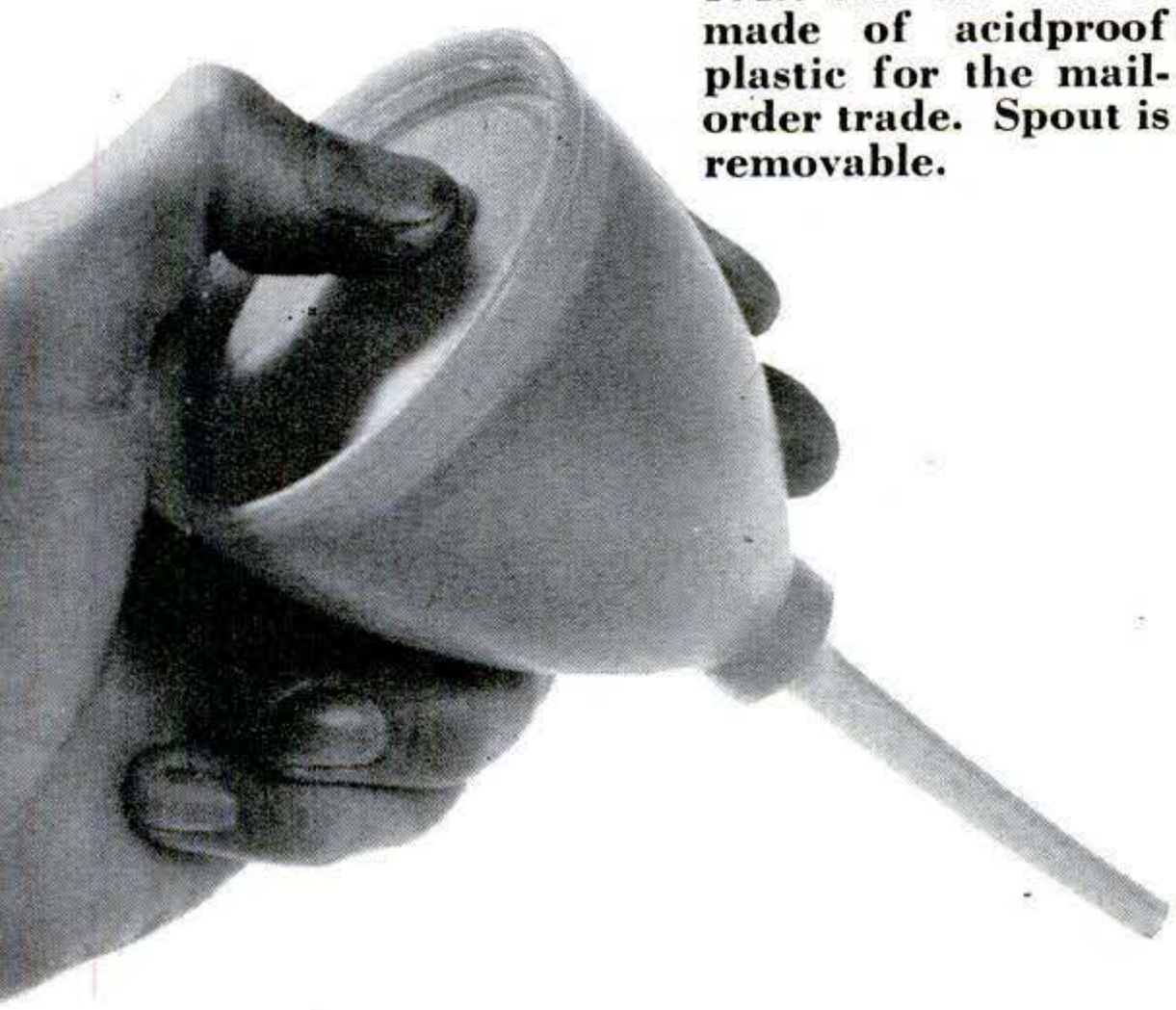
MAUNA LOA UKULELE was rushed to production after Arthur Godfrey publicized uke on TV. It can be sold cheaply by mail because it is mass-produced plastic instead of traditional wood.

PLASTIC PISTOLS go big with kids. Top three, reading down, are frontier gun, automatic, and space gun—all water pistols. Bottom spring gun fires rubber-tipped dart.

FEEDING DISHES for very small fry are plastic molded to look like trains and boats. Chow Scow (top) can be filled with hot water to keep food warm. Chow Chow Train (below) is big seller.



EVEN AN OIL CAN is made of acidproof plastic for the mail-order trade. Spout is removable.



PLASTIC BOAT is balloon-powered. Air escaping through stern pushes it along. When air is gone, boat sinks.

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LUCITE TREASURE DOME sells by the thousands each month. It displays medals or old watches hung by wire from top. Maker expects to sell 100,000 of this $4 size in '53. Larger ones cost up to $50 each.

KAN-KUP fits around top of beer can so you can drink from it without spilling. Item failed in stores, sells fast by mail.

fortune may be won or lost on a single item. Every time a new idea pops up, the manufacturer must figure on spending perhaps $25,000 or more before it's rolling. Up to $10,000 for dies. Another $10,000 for materials, boxes and promotional literature. Maybe $30,000 for advertising. Then the orders come in—or they don't. There's no sure way of knowing in advance.

Some Items Are Mail-Order Naturals

What makes a good mail-order item? Generally, says mail-order expert F. G. Berlin, it's an item that doesn't sell readily across retail counters. It needs words, and usually a picture, to explain it.

You can see a circular plastic collar alongside a beer can. What's it for? Berlin makes this simple collar. Before offering it through the mails, he tried it out in a Los Angeles drugstore. One day he approached the counter, asked the young sales lady to explain it. Picking up can and collar, she said, after a long pause, "Must be a coaster." Instead, the collar fits over the open end to make drinking easier. Since then, the mails have sold more than a million can collars.

Few gimmicks just happen. Hard thought and often long experiments go into their creation. Take "Pump-It." This is a pump, thinner than your little finger. It squirts catsup from a bottle.

A man walked into the Hollywood office of Clair E. Young, then manufacturing toys, and said, "Make me a gadget that will extract catsup from a bottle, and I'll sell a million." The first model wouldn't work. Other designs followed. At last Young came up with a model made of red polystyrene, clear poly, neoprene and stainless steel.

Then the blow fell. There was no customer for a million catsup pumps. Could a million customers be found for one apiece? A company was formed and an advertising campaign started. Shortly the pump began to catch on. Now the dies are busy, day and night, producing well into the third million.

One of the biggest winners in the race for sales is a simple little Lucite dome that stands on a base of hardwood. Berlin calls it a "treasure dome."

"There must be millions of homes with war medals and old watches rusting in old trunks and dressers," he reasoned. "Folks would get them out if only they had some way to display them."

Hot Cakes Sell Slowly by Comparison

Last April he ran two magazine ads. Sales were so good he upped his advertising, adding more magazines. Already he's taking in $20,000 a month. He sells both directly through the mail and through other mail-order houses. In a two-week period, the Marshall Field store in Chicago, starting with an order for six dozen, increased its purchases to 500, then 1,000.

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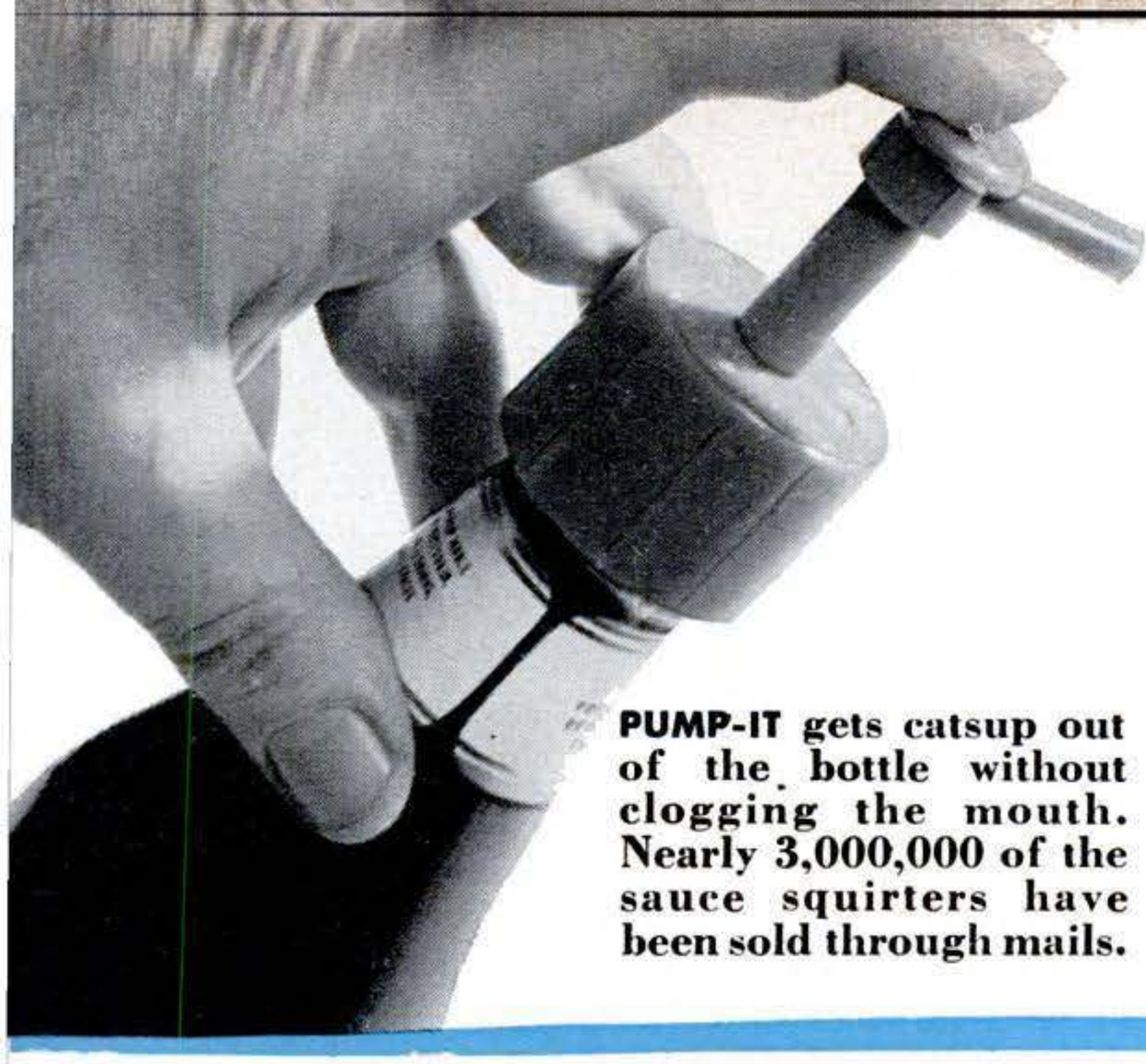
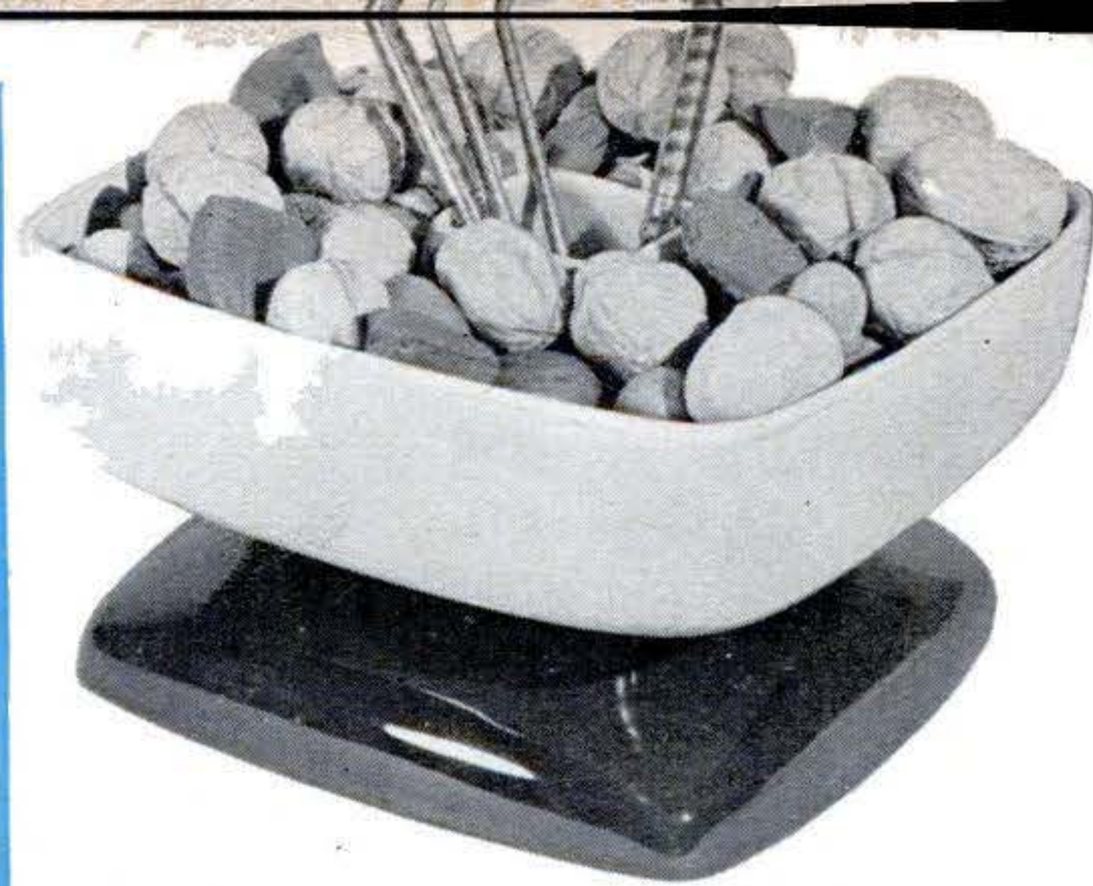


PUMP-IT gets catsup out of the bottle without clogging the mouth. Nearly 3,000,000 of the sauce squirters have been sold through mails.



CERAMIC BOWL for nuts has center compartment to hold shells. Compartment lifts out for emptying.

Louis Glaser saw a group of children at play around a tractor on a construction job near his home one day. At that time, a year ago, mechanical toys of this sort were being made of metal, and were expensive. In plastic, Glaser reasoned, the price would come down to less than a dollar. But the toys would have to be authentic.

Glaser grabbed a plane for Chicago. There he obtained blueprints and permission from Caterpillar to use the company's name. From Dow Chemical Co., he secured a tough molding plastic. Last April he started production of a scraper, earth mover and grader. Both Caterpillar and Dow have mentioned the toys in advertising their own products.

Eleven years ago Leo White retired from his New York business of manufacturing dolls and toys. He moved to Los Angeles, intended to while away his days on the golf course. He couldn't stand the boredom. Shortly he rented space to "do a little tinkering." He became interested in plastics.

Squirt Guns for Little Squirts

His tinkering grew rapidly into a line of molded housewares. Then came toys. Among them a little polystyrene water pistol you can hide in your hand. Its diminutive pump squirts 200 shots at one filling. Kids bought 2,000,000 the first year, came back for 5,500,000 the next, grabbed 9,000,000 last year. White expects to sell 15,000,000 in '53. His machines grind out the little squirters 24 hours a day, 360 days a year.

These grab-the-main-chance boys sel-

Here's What Experts Want in a Mail-Order Item

HERE are eight characteristics of the ideal mail-order product, according to three experts whose views were reported in the magazine *Advertising Age*.

- A product that everyone needs or can use.
- A price between $2 and $5, making installment payment unnecessary. (If no repeat business is possible, say the experts, the selling price should be four times the product's cost at the warehouse.)
- A value that can be explained easily to the reader of the original advertisement.
- The possibility of a repeat sale of a similar or related product.
- Exclusive features or a patented design that shuts out store competition.
- No quick deterioration—otherwise product loses value if not delivered promptly or is returned.
- A product easy to pack, cheap to ship.
- A product that needs little or no servicing after delivery.

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dom rest on a single success. In White's Knickerbocker Toys plant I saw his future plans taking shape. Soon he will offer kids a submachine gun that squirts a stream of water 60 feet.

Ideas for toys spring from odd sources. Bernard Glukes, an aircraft engineer, sat in his home one evening studying pictures of snowflakes. He noticed that some forms seemed capable of interlocking. This simple observation led him to whittle out a dozen models, all exactly alike. By putting them together, he discovered he could create interesting forms. Now he's drawing royalties from a Los Angeles manufacturer who turns them out in colored polystyrene.

Space Men Chase Cowboys Out of Picture

Children's whims govern the toy output. The cowboy is passing, the space man taking his place. That's why kids are grabbing up Barney Rosson's space helmet. Looks something like the latest Air Force helmet designed for wearing with a pressure suit. A kid blows up the vinyl plastic tank and oxygen tubes, dons the acetate butyrate helmet, and he's set for a trip anywhere his imagination carries him.

New ideas flow from these enterprising people every week. Maybe it's a metal gimmick that holds a hot egg while you crack it. A pancake griddle with built-in thermometer. A meat saw with grooved handle for tenderizing tough meats. Holders for spoons to prevent dripping. Or tweezer needles for patching torn clothing.

Some come from the proverbial garret. Following his discharge from the Air Force eight years ago, Jack Bozung began designing soap paints that would wash off easily. He mixed them in his garage at home. Paints led to blackboards for youngsters. Today his Celco Corp. has 60 employees, grosses a million dollars a year.

Hit the Jack Pot—or Lose Your Shirt

W. R. Moody started his successful luggage-tag business in his living room. The personalized tags, plastic stamped with name and address, overflowed into a Burbank shop where 12 workers will turn out $100,000 worth of tags this year.

But a new item may be a dud. Its promoter will soon know if orders fail to arrive. S. W. Barrett has offered more than 800 different things in eight years. Only a few rang the bell. A metal rack for hanging skirts failed to click until he added a hook at one end, permitting it to be suspended horizontally for drying ladies' hose. Now it goes by thousands.

There's no sure-fire rule for success in this business. You may hit the jack pot or lose your shirt.

"You pays your money," says Barrett, "and takes your chance." END

Car Tips Its Bonnet Hydraulically to Bare Engine

It's no trick to get at the Ford V-8 engine of this Monte Carlo Saloon Allard. The whole front part of the car, which is hinged behind the bumper, raises and lowers hydraulically like the tops on American convertibles.

The British right-hand drive leaves plenty of room for a spare tire at the left of the engine. This model has de Dion rear suspension, previously used mainly on competition cars. The car costs about $4,600.

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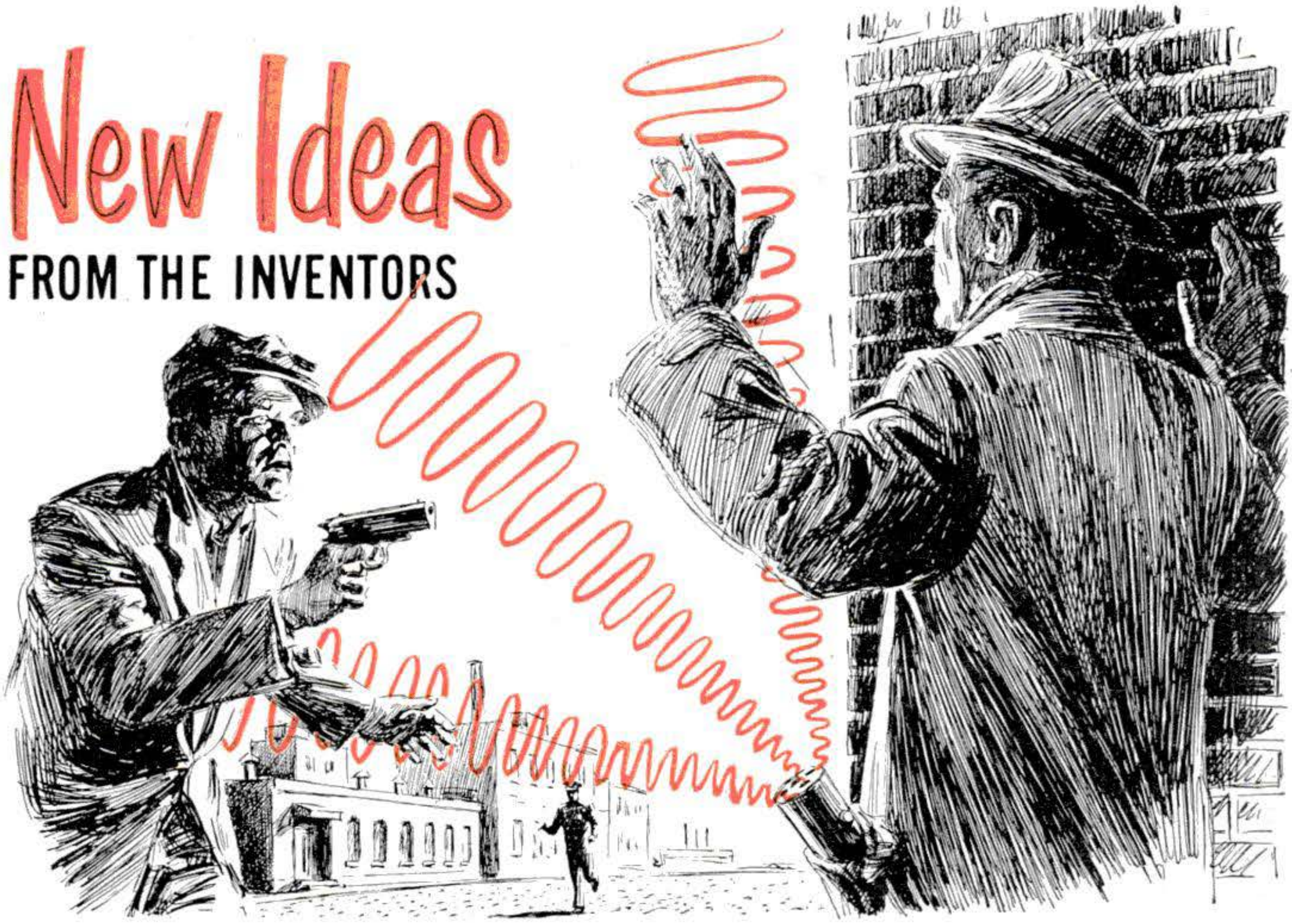
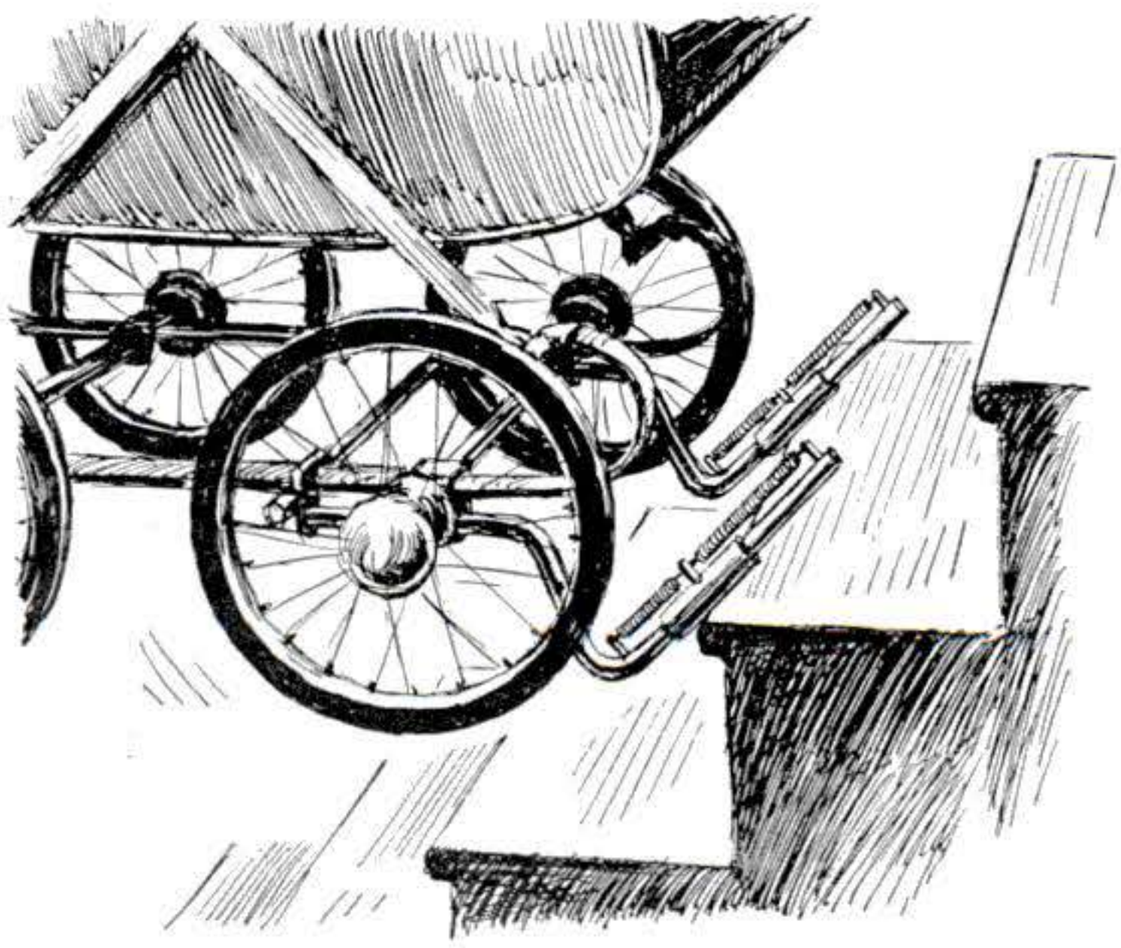
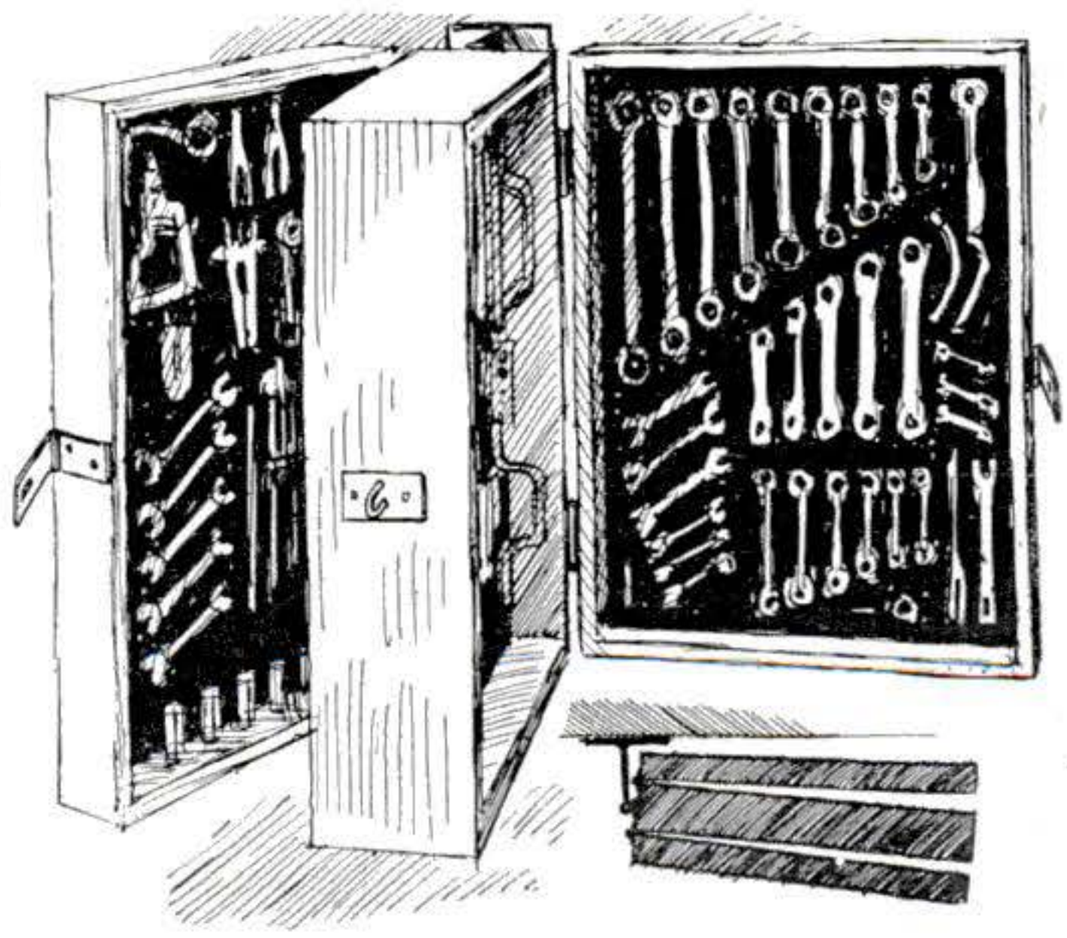
New Ideas
FROM THE INVENTORS



1 Alarm to Foil Thugs. A siren run by flashlight cells in this pocket-size alarm would rout a thug and summon aid. If danger threatens, you would press a button to lock its switch on. There would be no way to turn off the noise, which would continue until the battery ran down. The device is intended to safeguard men and women who must travel along lonely streets at night, as well as messengers carrying money.



2 Carriage to Climb Stairs. Up and down steps, this baby carriage could be handled smoothly and easily. Tubular slides on the undercarriage engage a stair tread while the wheels are lifted past its edge. Then, springs return the slides to their former position. Street curbs would be negotiated in the same way.



3 Toolbox to Open Like Book. Mounted on the wall over a bench, this tool cabinet would take up no bench space—and would store more tools in plain sight and easy reach, the inventor maintains, than any he has seen. Three hinged sections open like pages of a book, as above, or swing back to fold together and close (inset).

Please turn the page for more new ideas.

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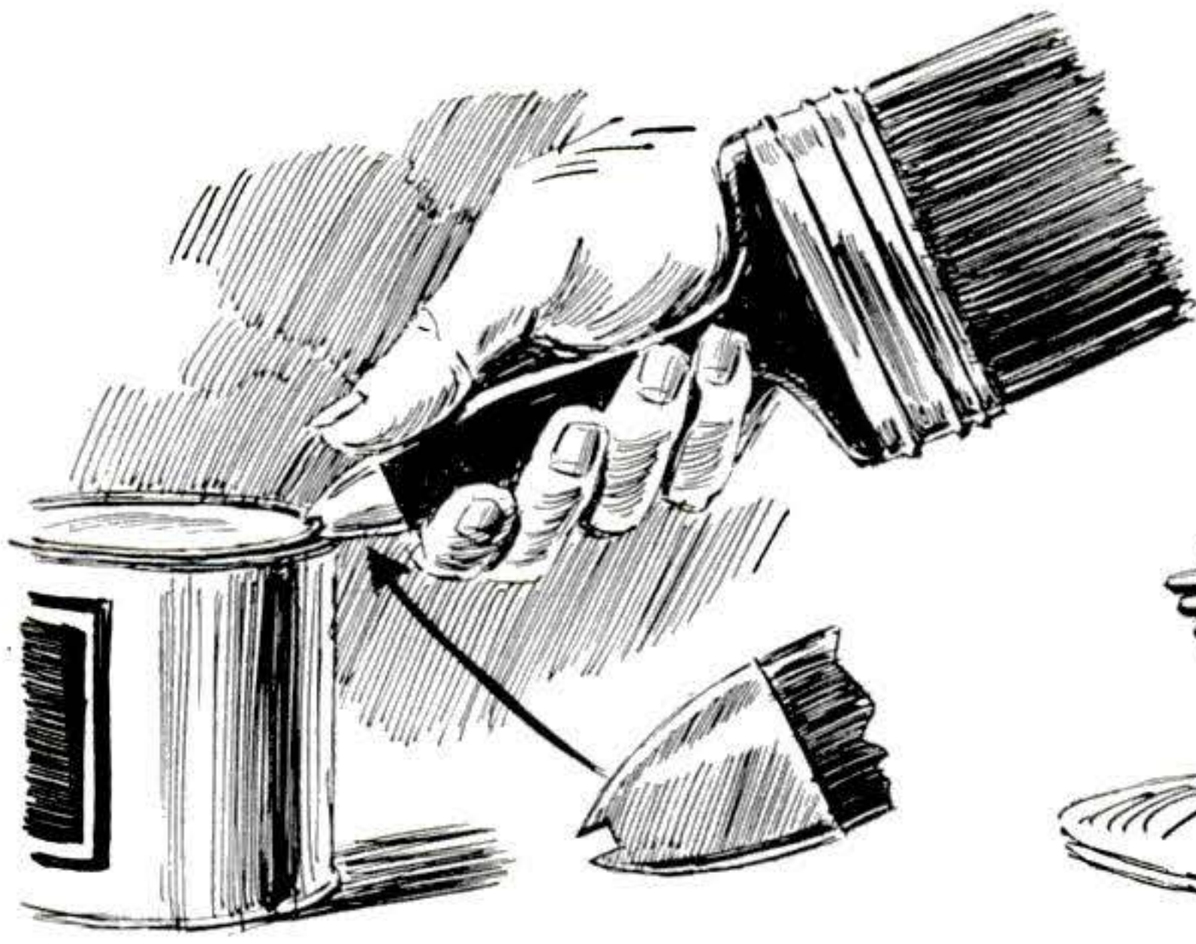
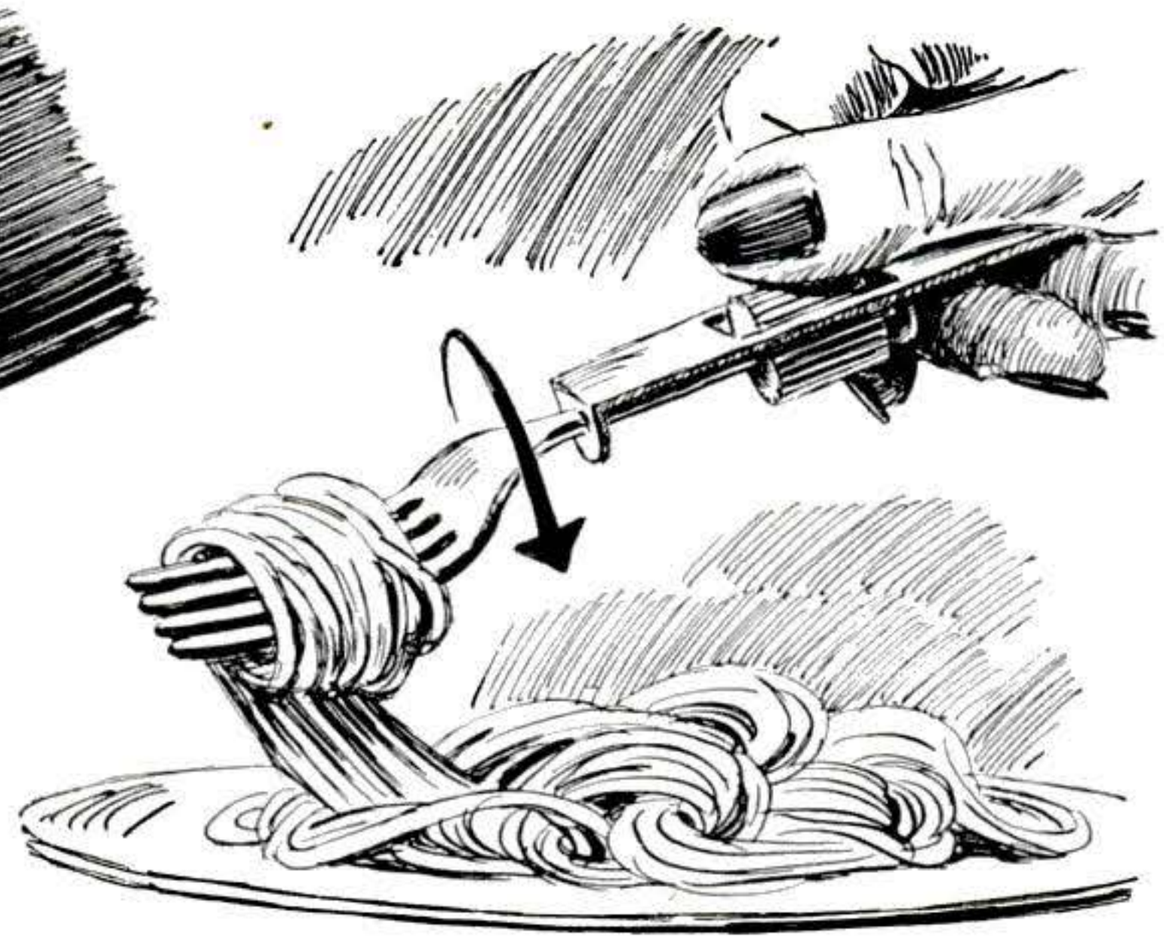
MORE New Ideas from the Inventors

4 Snow Remover to Clear Roof. With this invention, you could prevent accumulating snow from choking gutters and causing leaks—and you wouldn't even have to go out in the cold to do it. A rake on a curved shaft would scrape snow off the roof when manipulated from within a window, by using two handles and by extending or withdrawing a frame of pivoted bars that rests against the body for counterbalance.



5 Brush to Open Paint Can. You wouldn't have to hunt around for a screwdriver or other tool to open a paint can if you had this double-purpose paintbrush. Its handle is fitted with a notched metal tip that's designed to hook under the can lid and pry it off.



6 Fork to Tame Spaghetti. Picking up long, slippery strands of spaghetti would be easy with this rotating fork. You just twirl a knob in the handle and it spins the tines so that they quickly wind up the spaghetti in neat coils without your having to twist the fork itself.

Patents on these inventions have been granted to: 1. Anthony Merola, Pittsburgh, Pa.; 2. Hurley M. Creveling, Elizabeth, N. J.; 3. Alfred E. Grennan, Benton, Kan.; 4. Edward G. Fischer, Holliston, Mass.; 5. Emerson T. Oliver, Marblehead, Mass.; 6. Philippe Piche, Valleyfield, Que.

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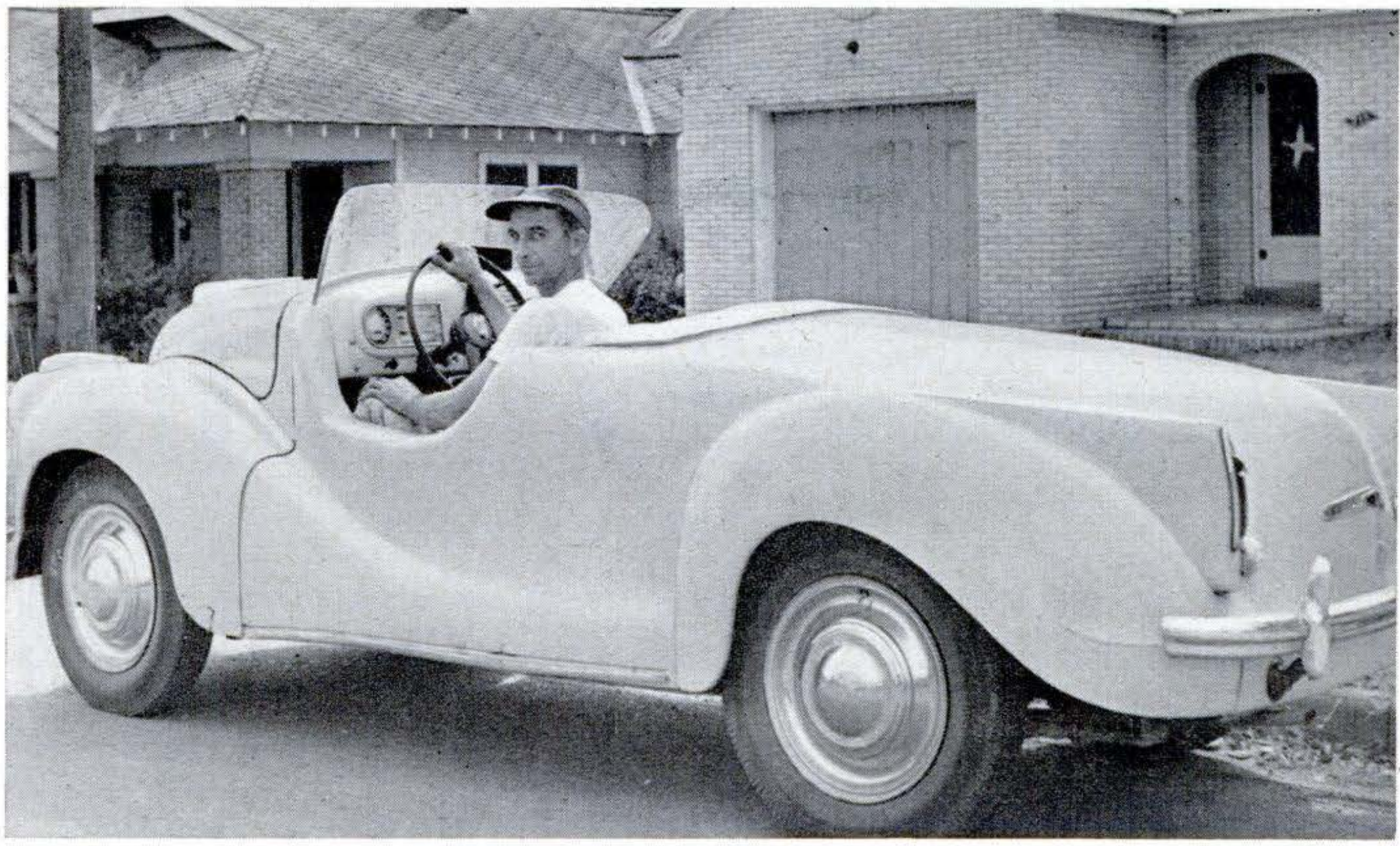
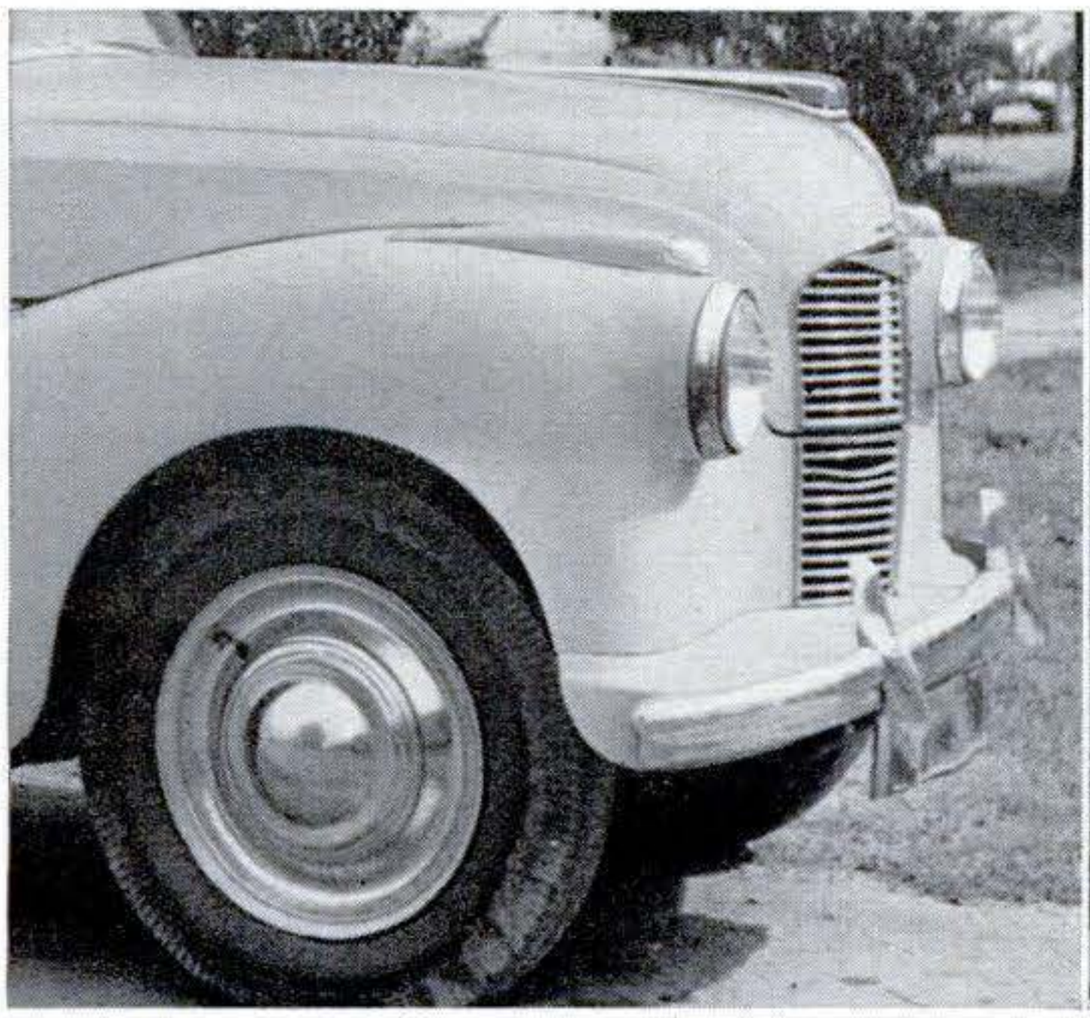


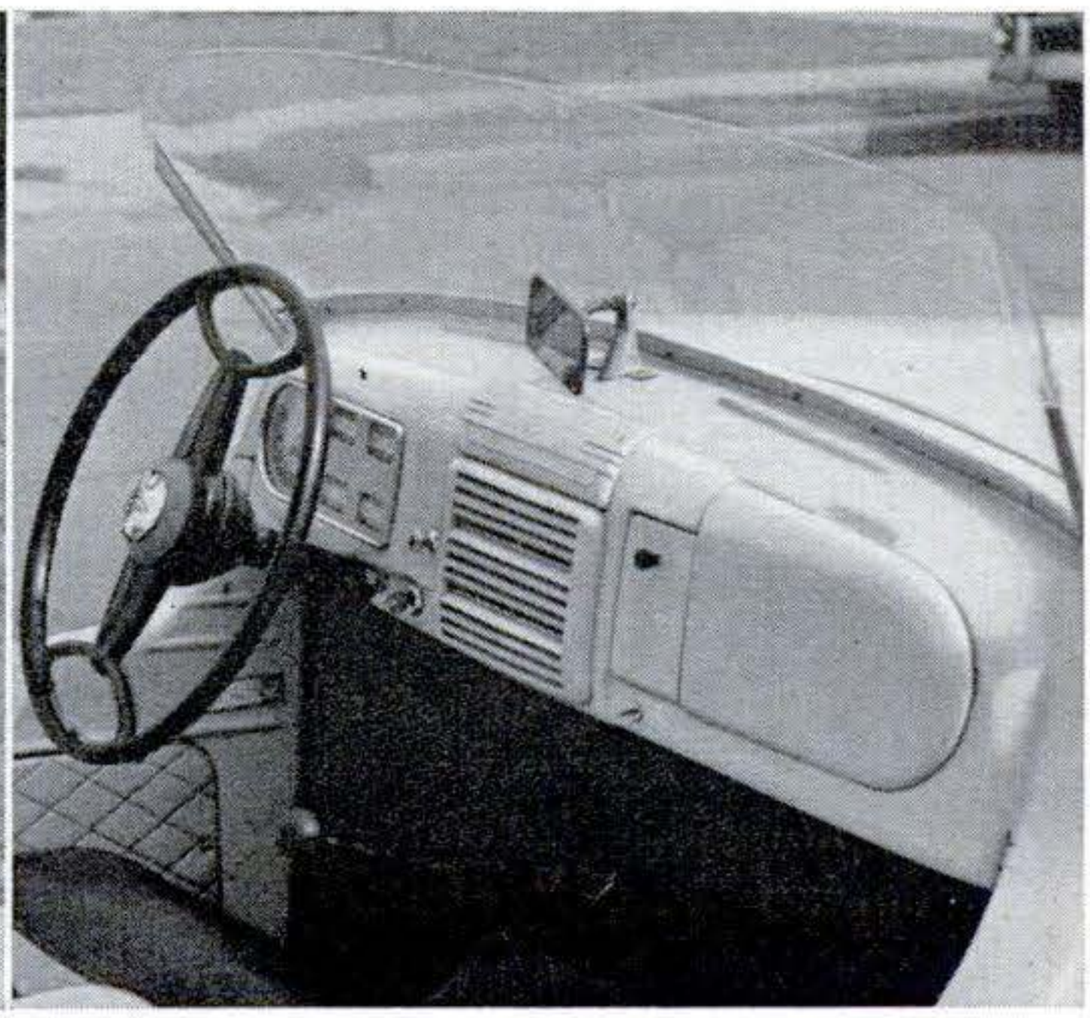
LESS THAN $125 was Larry Miller's total cash outlay for this unique little sports job, which was reborn from the burned-out wreckage of a 1948 Austin. Note absence of chrome trim.

Junked Austin Makes Trim Sports Car

A COUPLE of years ago, Larry Miller parted with a sawbuck and a fin and became sole owner of a burned-up Austin. Subsequent investments included $19 for a battery, $65 for tires, $25 for upholstery—and two years' spare time. Result: the neat little three-seater pictured here. Like boardinghouse hash, a little bit of everything went into it. Among the baby sports car's ancestors are a '50 Ford truck (dashboard), a '49 Ford (its hood is now the Austin's rear deck), a '41 Chevvy truck (headlights), a '41 Olds (steering wheel), a '41 Ford station wagon (seat), and an Olds "88" showroom model (windshield is cut from transparent hood used to display Rocket engine). Spare parts and paint were easy—Miller runs a body-and-paint shop in Magnolia, Ark.



THE FRONT of the new sportster is standard '48 Austin except for the headlights, which came from a 1941 Chevrolet truck.



THE DASH PANEL and cowl of a 1950 Ford pickup truck were cut down to fit. The wheel and shaft once steered a 1941 Oldsmobile.

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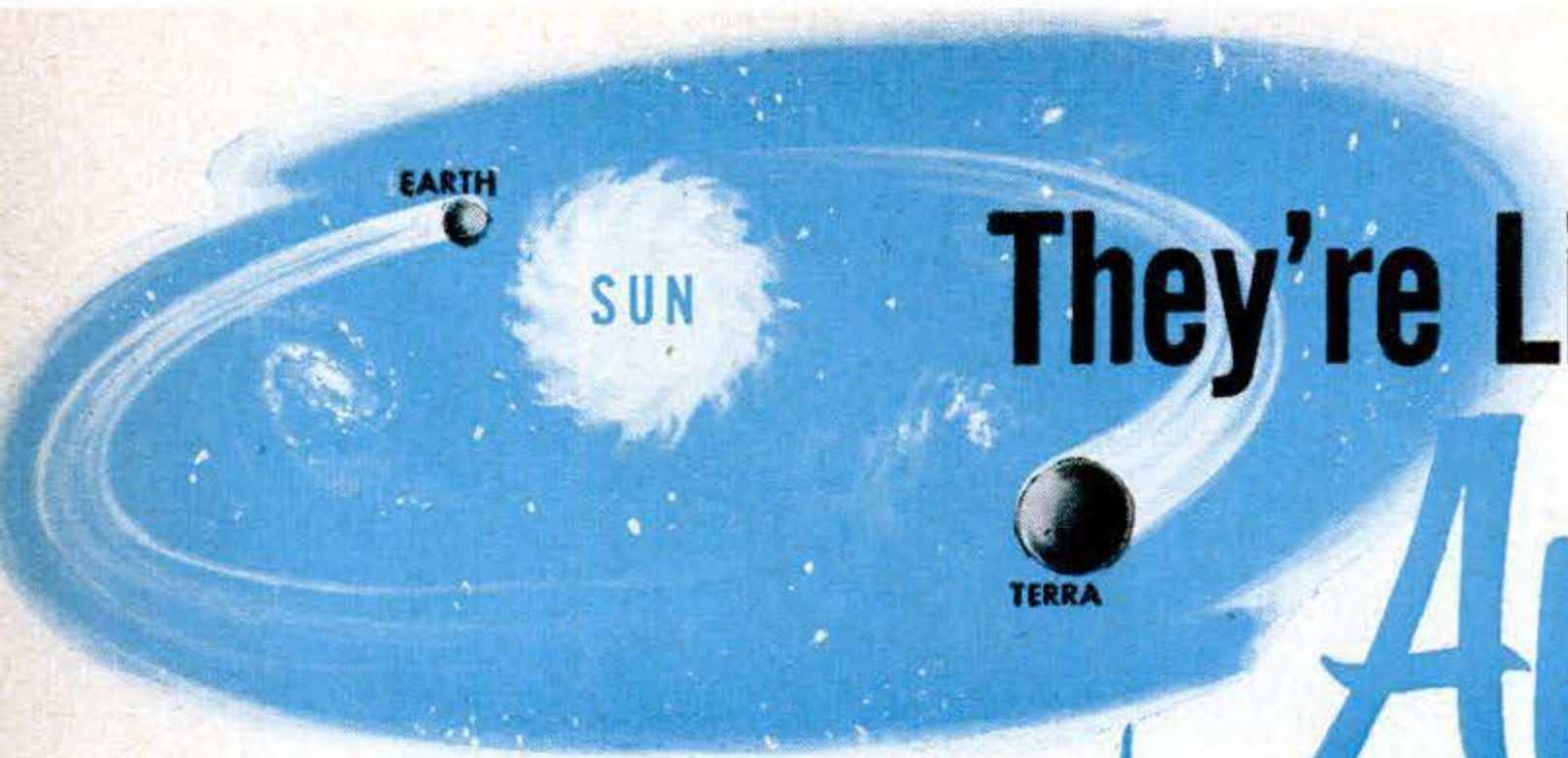


They're Living Off Another

Oskar Lebeck and Alden McWilliams dreamed up a world and made it pay by picturing it on the comic pages—for 10,000,000 readers.

MORE than 10,000,000 newspaper readers are all excited about the discovery of a new planet, a twin of ours. But no astronomer has given it a second thought. That's because Terra, as the new planet is called, was found, not in the heavens, but in a cartoon strip.

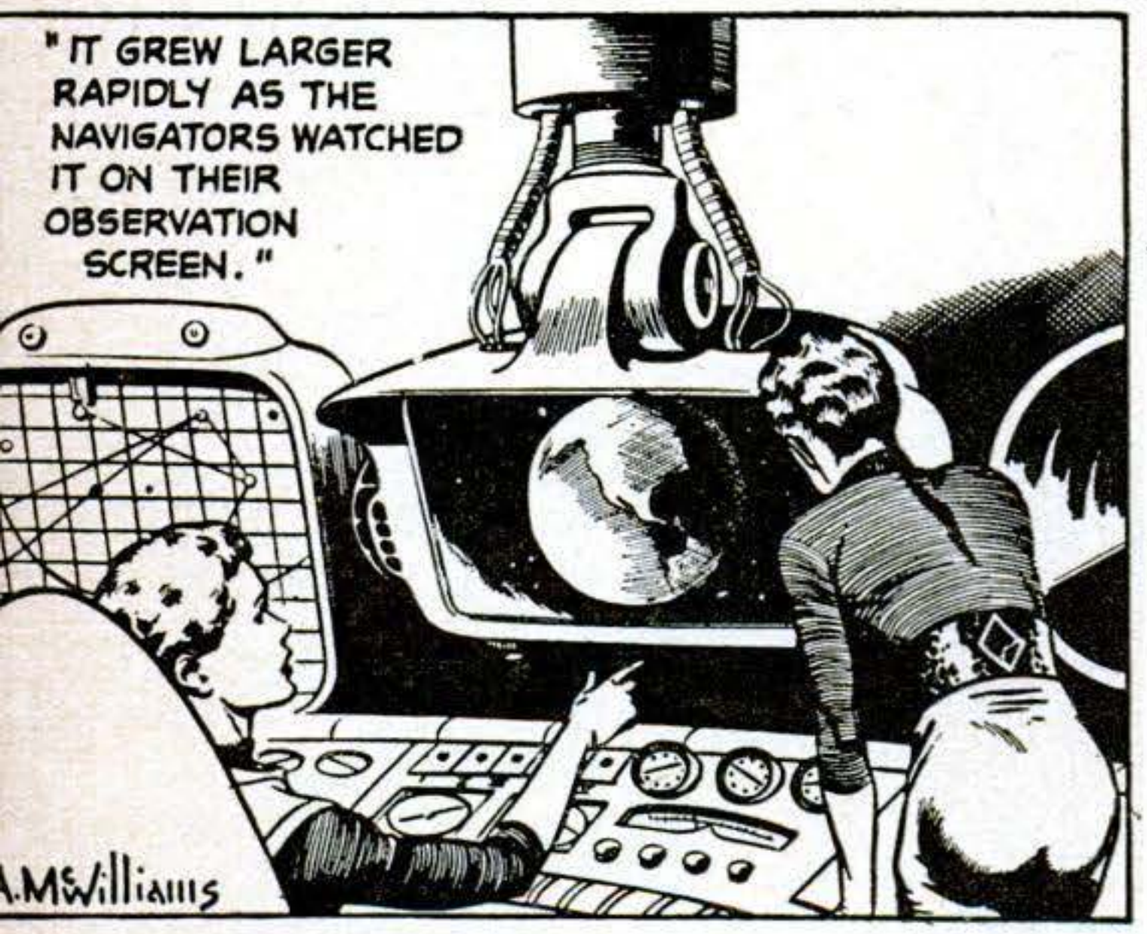
The strip, "Twin Earths," is a spectacular newcomer itself. It got off to the fastest start in newspaper-syndicate history, and has spun to stardom at flying-saucer speed.

Oskar Lebeck, of Croton-on-Hudson, N. Y., who thought up "Twin Earths," and Alden McWilliams, of Noroton Heights, Conn., who draws it, have "created" quite a planet.

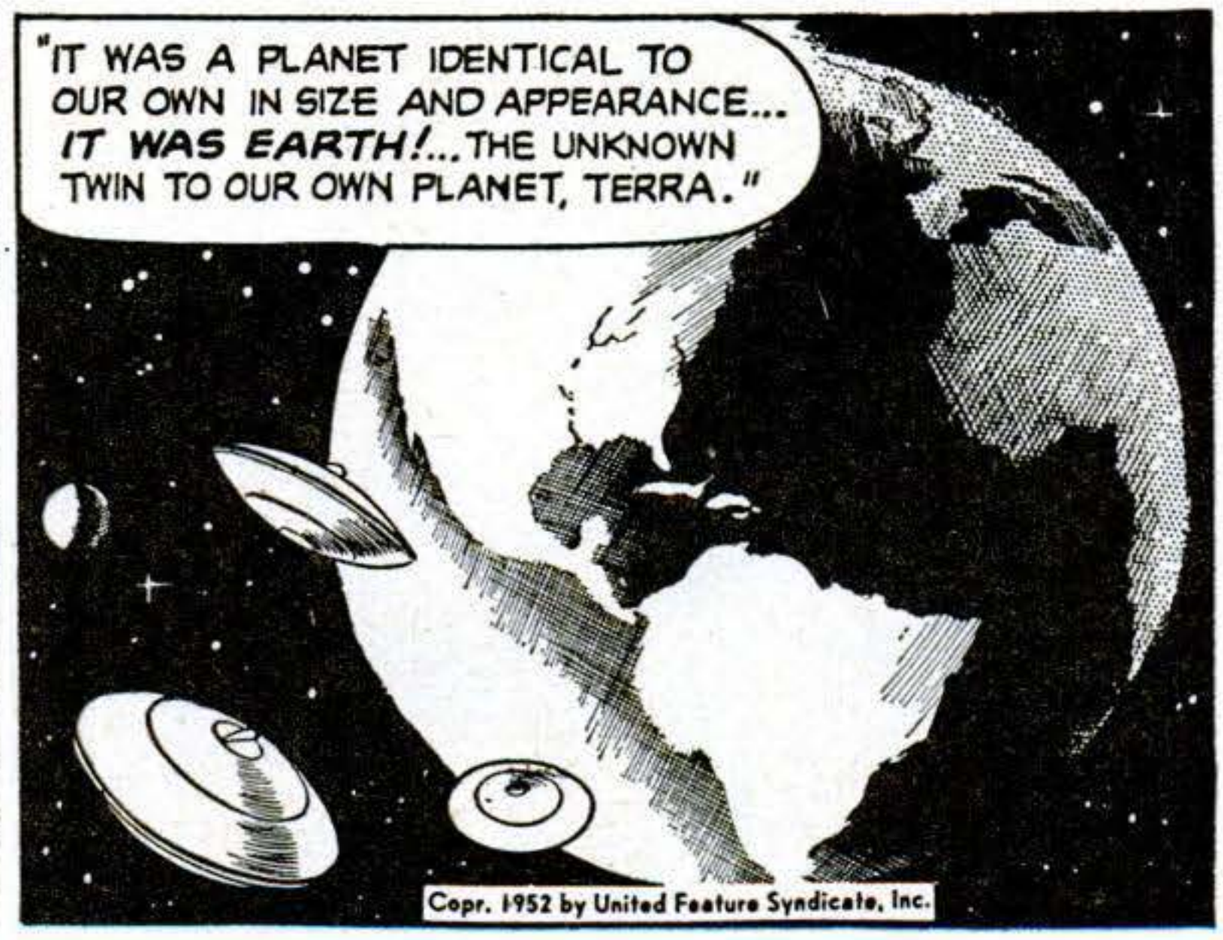
In the first place, we can't see Terra. It is the same size and composition as Earth, and the same distance from the sun, but it is on the other side of the sun. And because it travels in the same orbit as the earth and at the same speed, we never will be able to see it—except by space ship, in future installments of "Twin Earths."

By all the rules for adventure-strip writing, "Twin Earths" should have been a bust. It makes no attempt to interest children. It doesn't even try to appeal to all adults—just those who are interested in science. And its fantasy isn't very fantastic.

Lebeck and McWilliams, whose homes



EARTH IS DISCOVERED by some girls from Terra, our twin planet, on a flying-saucer trip.



THIS WAS IN 1903, according to "Twin Earths." Vana, heroine of the strip, is the narrator.

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By Don Weldon

Planet

AFTER 14 YEARS of creating comic books together, Oskar Lebeck (at left above) and Alden McWilliams are an expert team. They hit few snags in plotting and drawing "Twin Earths."

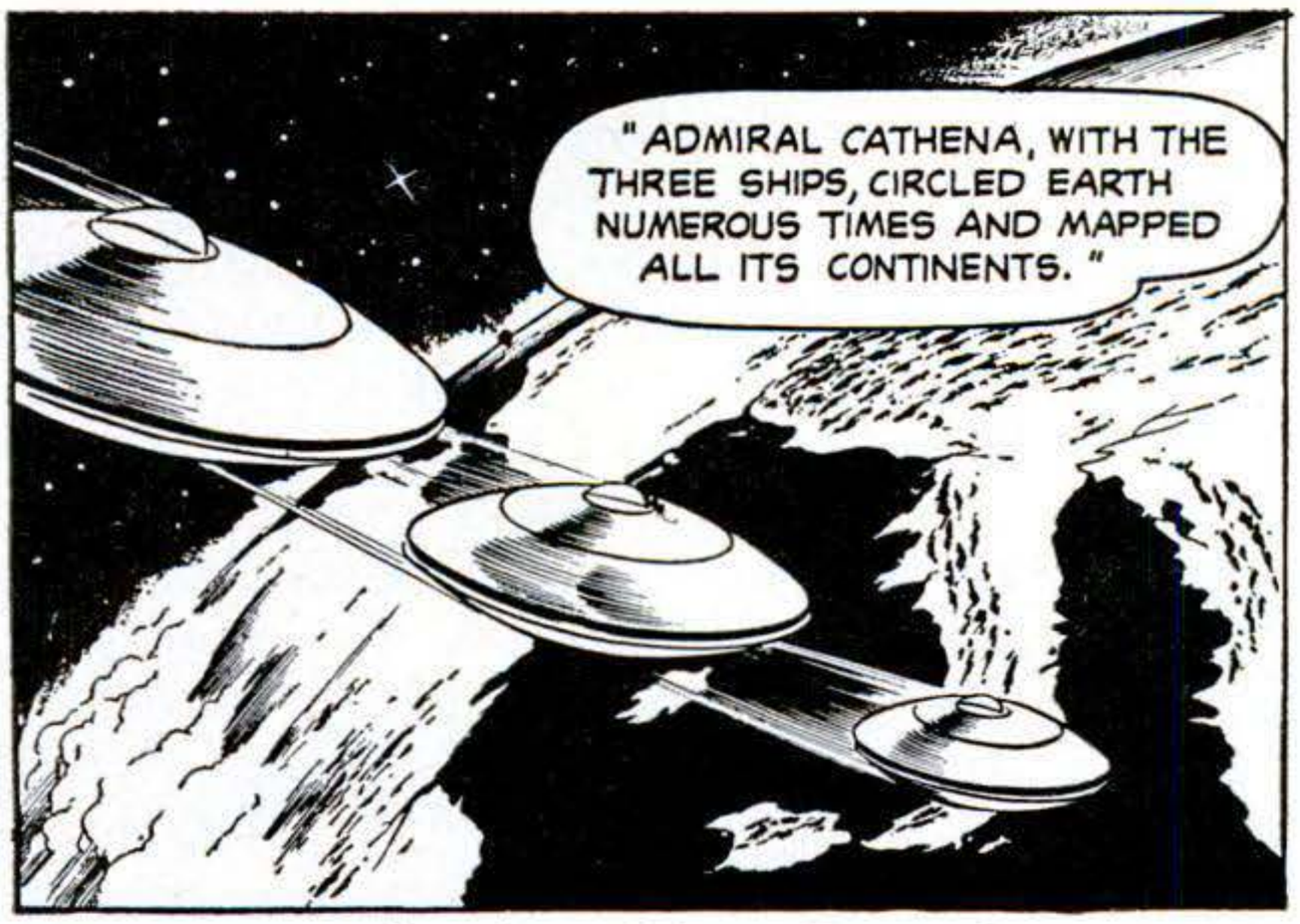
are only a few miles apart, keep nine or 10 weeks ahead of their readers. One plots, the other draws exciting events on this planet and on Terra, and then they smooth out details in weekly meetings.

Both Have Artistic Talents

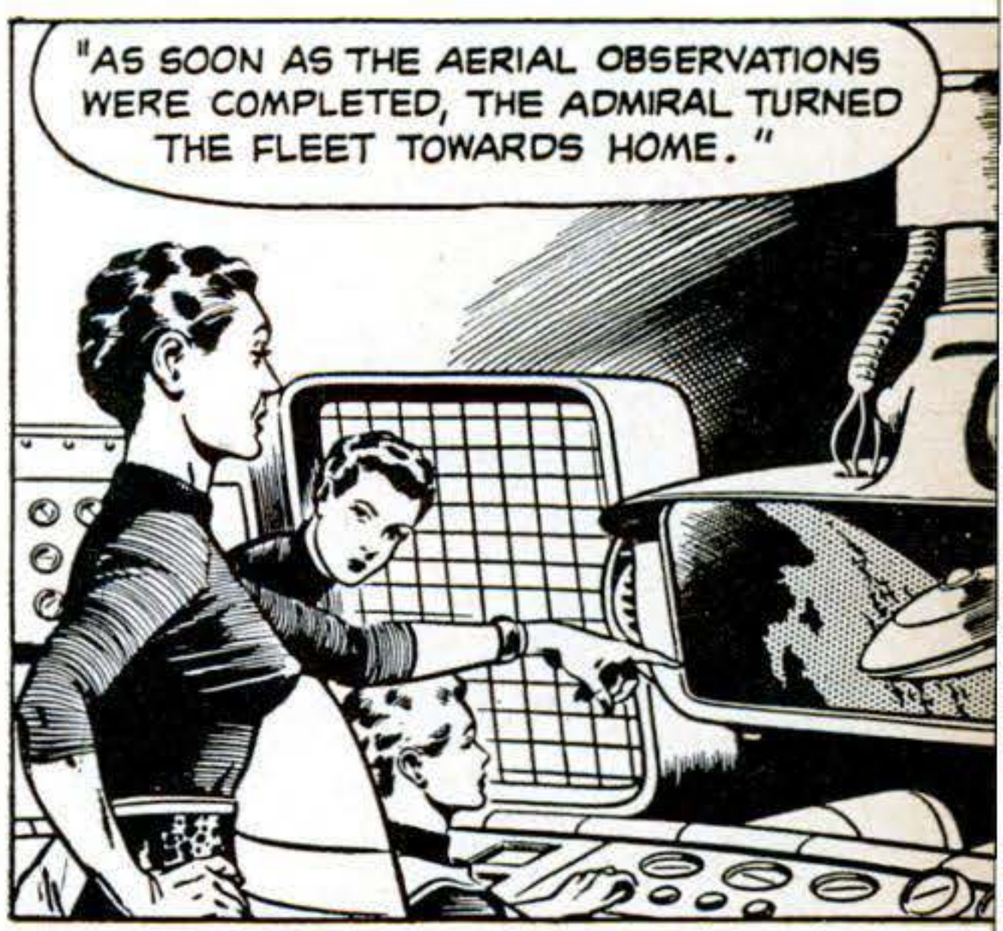
Lebeck, nearing 50, was born in Germany. His career has included illustrating children's books, designing stage sets, textiles and furniture, and being the highly successful art director and managing editor of a publishing company. Two of his brainstorms proved highly prophetic. "Stratosphere Jim" and "Rex, King of the Deep" concerned superfortresses and submarine plane carriers with catapult launchers long before such craft were developed. He is undoubtedly just as clairvoyant about some of the marvels of "Twin Earths," but he *doesn't* believe that space travel is in the cards—except in comic strips.

McWilliams, 36, showed talent as an artist when he was a child, but he has never studied mechanical drawing or been a draftsman. Despite this, for the advanced life of Terra he confidently designs two-way TV sets to fit women's handbags, walnut-sized walkie-talkies, and other electronic wonders.

He doesn't use models for any of his futuristic gadgets, though he sometimes has to raid his 3½-year-old son's garage



LIKE COLUMBUS the admiral from Terra who saw us first led a squadron of three "ships."



AN ALL-GIRL PARTY found Earth. Men are very scarce on Terra, "Twin Earths" reveals.

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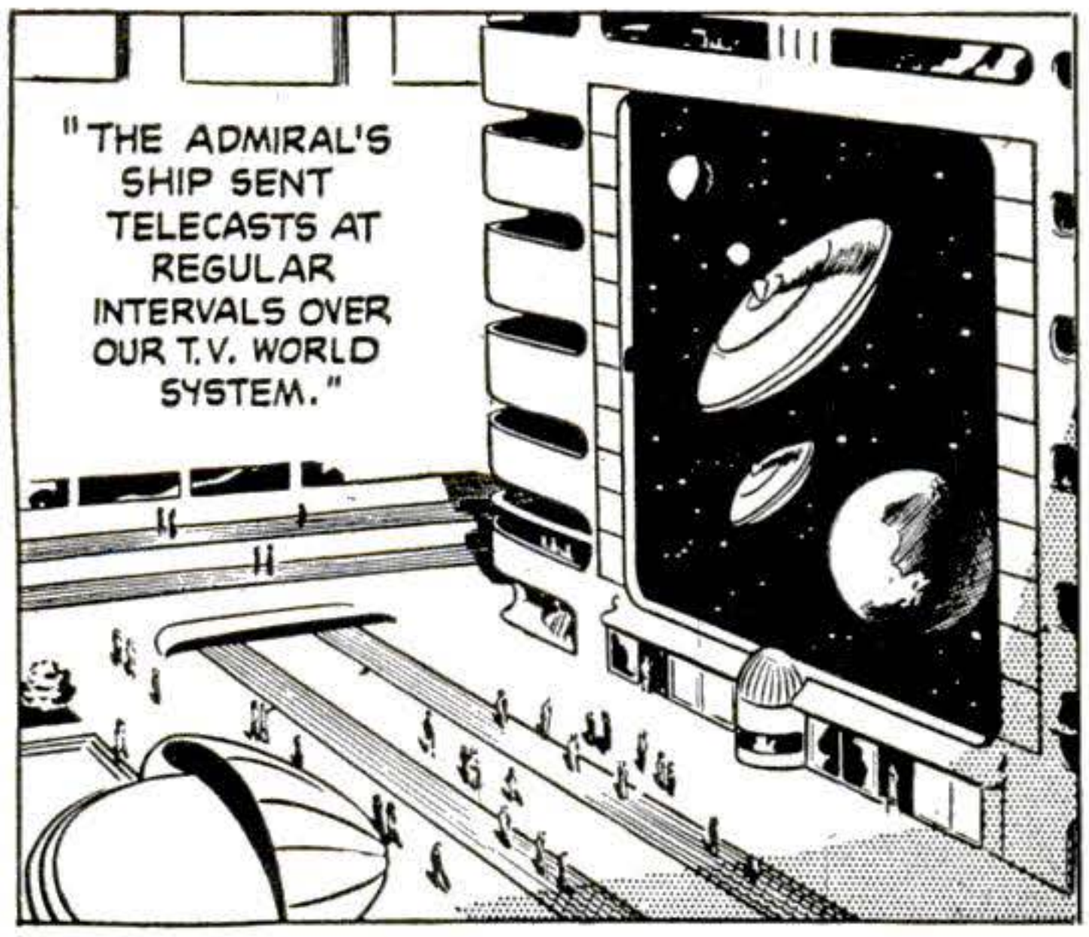
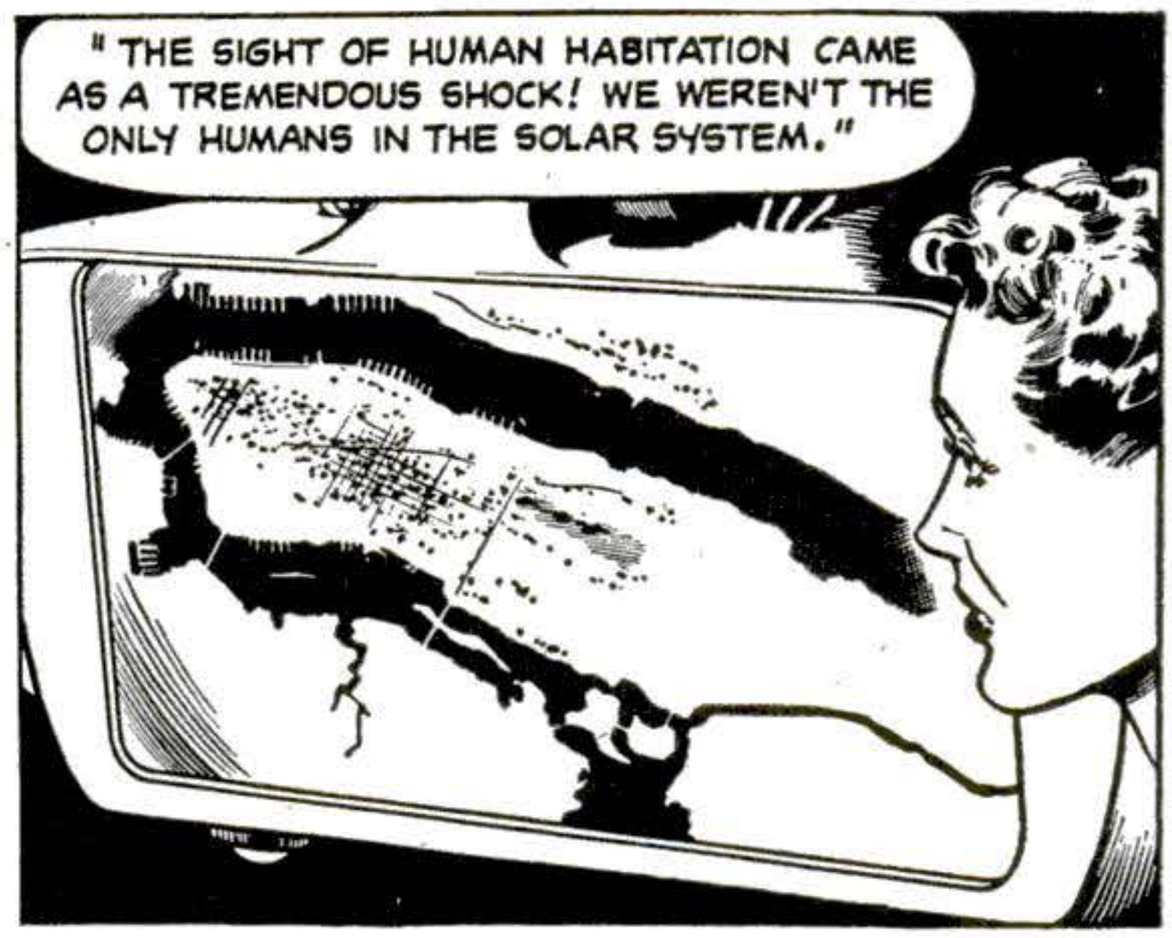
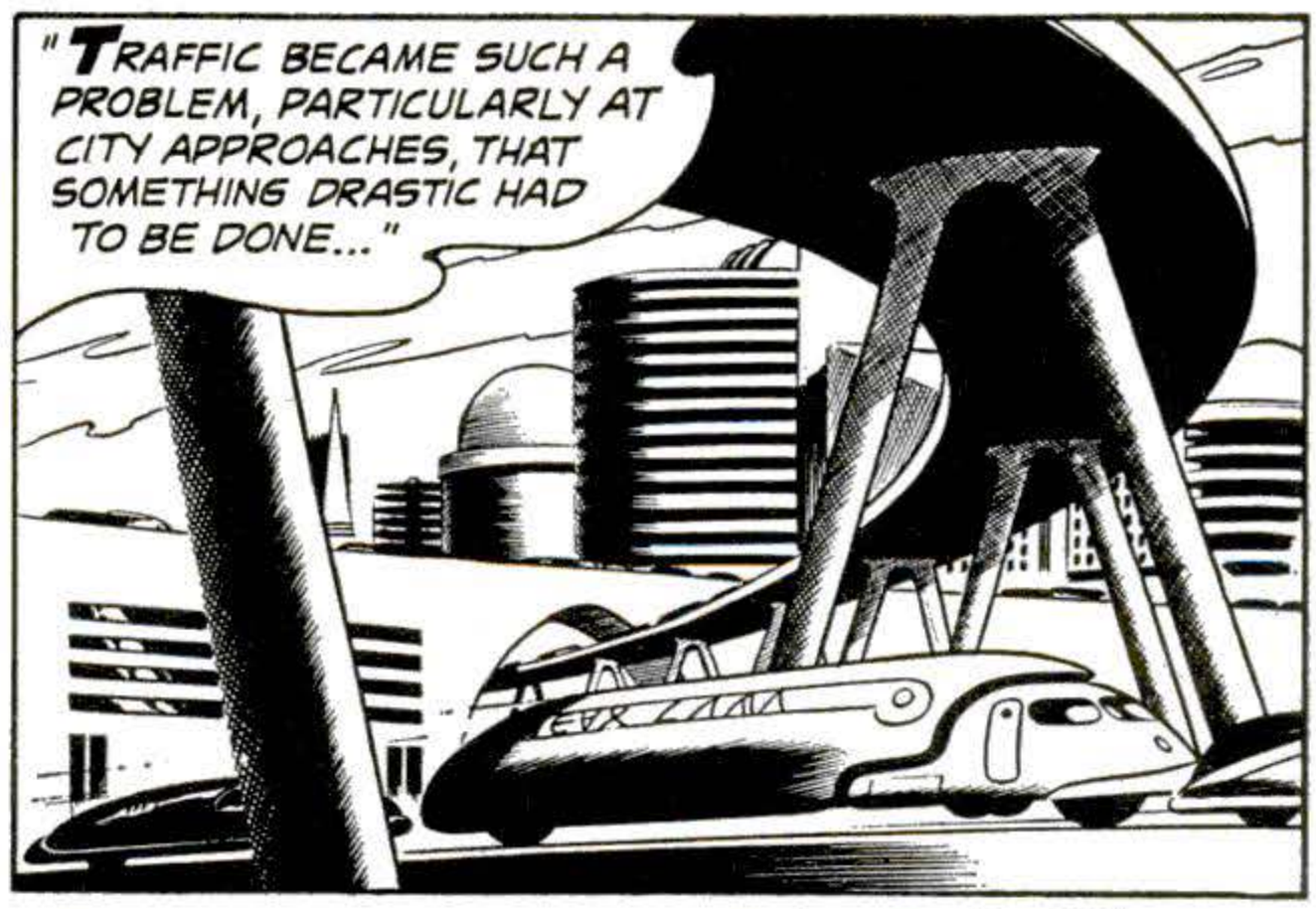


OUTDOOR TV SCREENS of mammoth size supposedly have long been in use on twin planet.



NOBODY HERE BUT US HUMANS, the girls from Terra found in a saucer's-eye view of New York.

ACCORDING TO VANA buses that ran on two wheels at top speed used to tear across Terra.



TRAFFIC GOT TOO HEAVY so the people of Terra abolished both automobiles and big cities.

of plastic cars when he needs help in visualizing an automobile from an unusual angle.

Lebeck, who has always read every book he could lay his hands on, spouts ideas at such a rate that he writes a week's six strips in an hour and a half.

When McWilliams tackles the same six strips, he usually completes his drawings in 4½ days, working from nine to five-thirty, with only a half-hour for lunch.

Young Woman Does Lettering

When the drawings are finished, McWilliams takes them to a young woman who makes a specialty of lettering the balloons (what the characters say to each other). Then they are ready for reproduction and distribution by the syndicate to newspapers, which pay from $3.50 to $150 a week, depending on circulation, for the right to print the strips.

In "Twin Earths," Lebeck and McWilliams passed up the science-fiction tendency to provide billion-mile rides between meals. They hung our twin planet in the skies only a short space hop away.

Terra is a peace-loving planet, too. That is rare indeed in these days when the writers of fantastic stories are so inclined to indulge in bloody encounters between humans and armies of little green monsters, animal or vegetable.

The friendly people of Terra are curious as the dickens about us though and, as the story of "Twin Earths" opens, have

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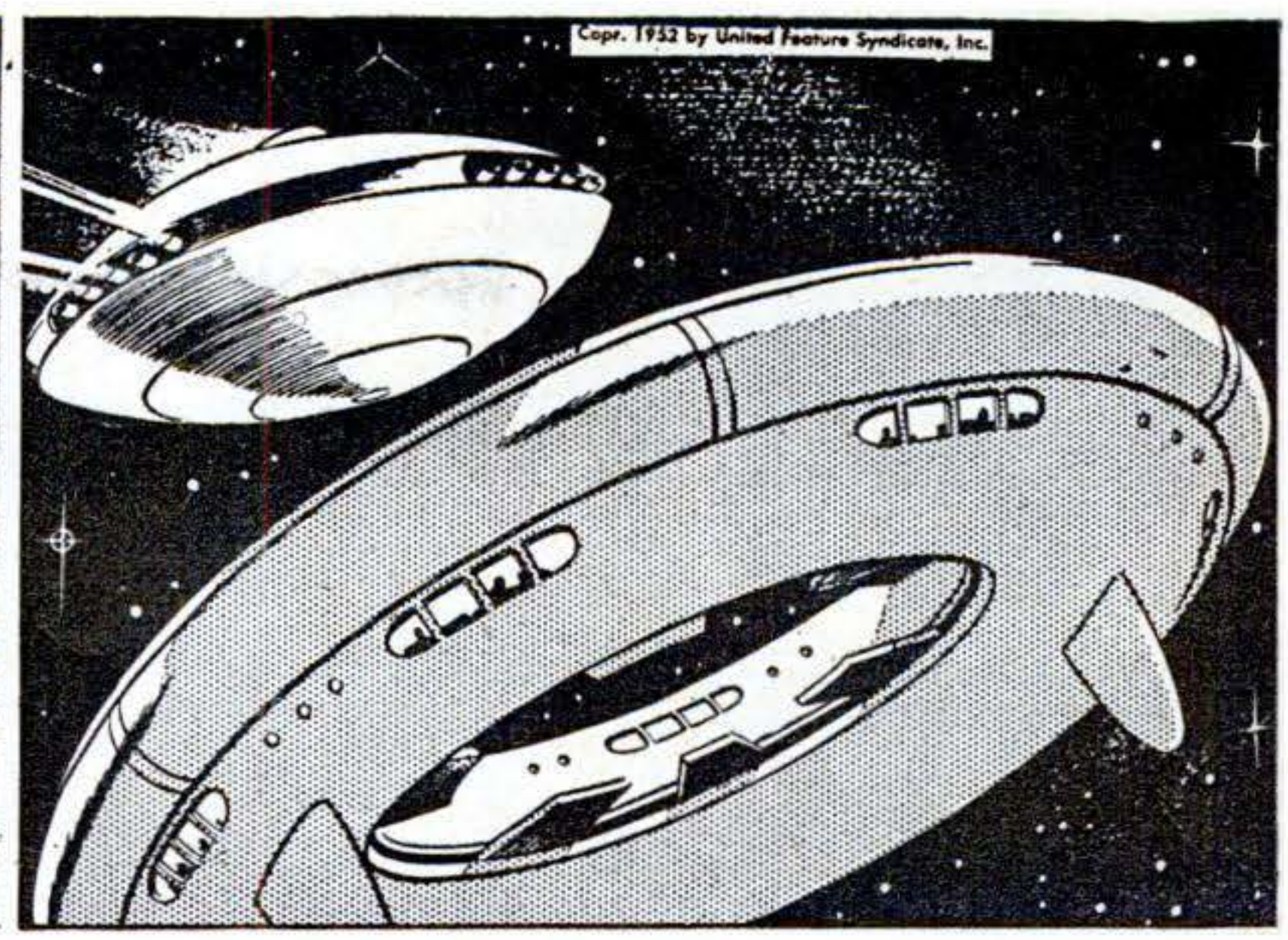
VANA IS VINDICATED for "Twin Earths" fans when the FBI checks on her with a telescope.



WHAT THE FBI SAW was a space station from Terra that Vana said was "watching" us.

PEOPLE SPREAD OUT all over Terra and traveled by means of an entirely new kind of vehicle.

TERRA'S AUTOPLANE, as visualized by McWilliams, is a combination car and flying saucer.

landed a few beautiful women here to look around and report. One of them, Vana, is the heroine of the adventure strip. The hero is an earthling, an FBI man named Garry Verth.

It was quite logical, as well as romantic, for Lebeck and McWilliams to select a woman as a spy for Terra because the twin planet they have pictured is almost entirely a woman's world. The men had largely succeeded in wiping themselves out in periodic wars when a plague came along that destroyed the male hormones of most of the survivors. Only a handful was left to keep the race going. For hundreds of years Terra has been 92 percent female.

Those Terra girls have the edge on us, too, in science and technology. According to Vana, they wear indestructible fabrics that repel or attract heat. They also eat synthetic meat, build things of weightless metals, and live in Polaroid houses that turn with the sun.

Terra Had No Luck with Rockets

Terra's women scientists experimented with rocket building but gave it up, the authors of "Twin Earths" assert.

About 1903, readers of the comic strip learn, the Terra girls developed flying saucers. The choice of that date was as carefully calculated as the many other details with which Lebeck and McWilliams have crowded their strip. That

[*Continued on page 254*]

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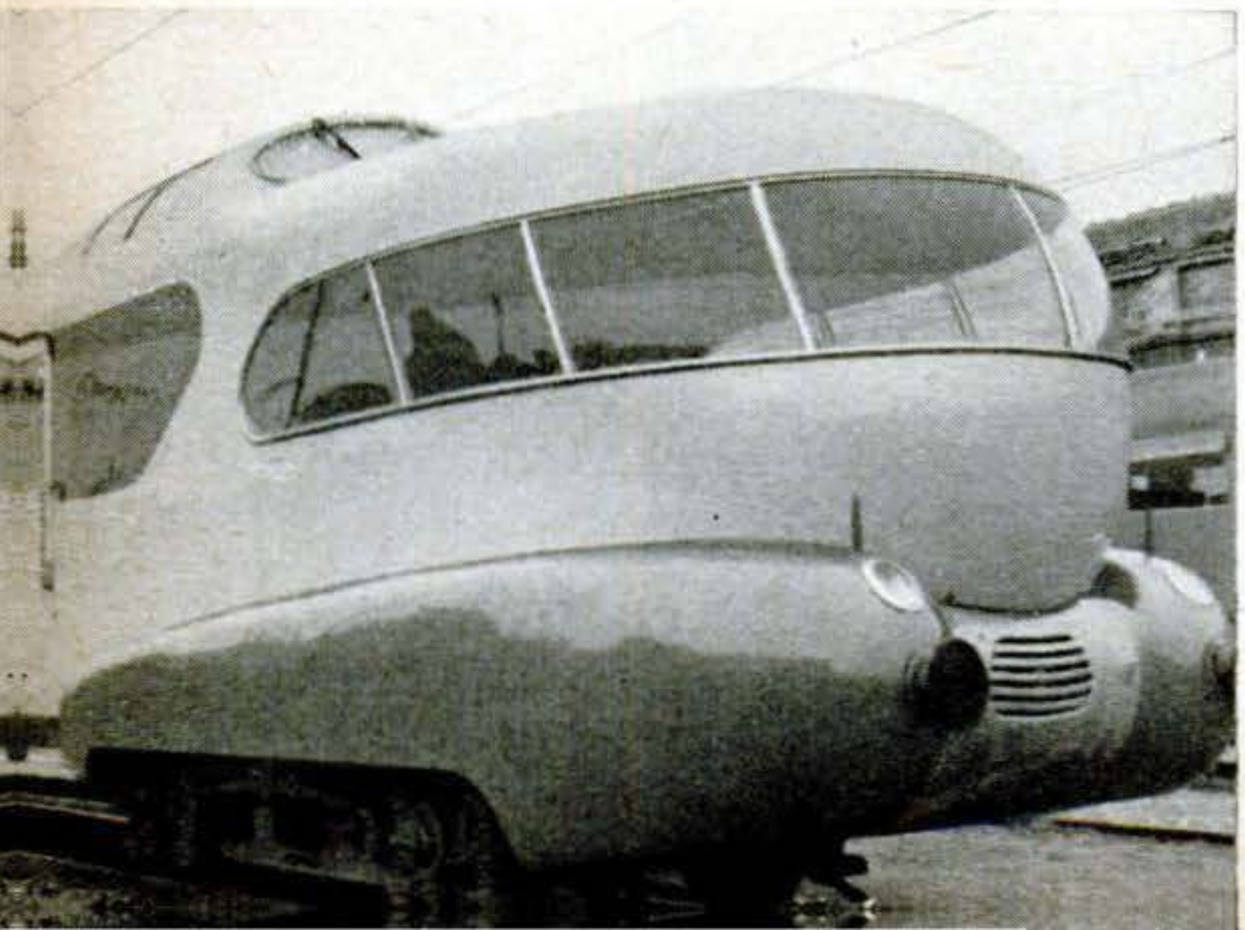
England Builds De Luxe Sportster with Automatic Overdrive

You're looking at what England calls the cheapest 100-mile-an-hour car ever built. It's the Healey Hundred and will sell here for $2,380. Powered by an Austin engine, it can hit 100 from a standing start in 37 seconds or cruise 35 miles on a gallon of gas. Secret of the car's high speed and low fuel consumption is said to be an electrically controlled overdrive which cuts in automatically when the speed reaches 50 miles an hour. The sportster recently smashed the Belgian national record for cars of its class, covering the kilometer (⅝ mile) at 111.73 miles per hour.

Observation Car Rides Up Front

Passengers see where they're going, instead of where they've been, on this new Italian electric train—they sit right up front. The door behind the sweeping fenders is the engineer's entrance. He sits in a cockpit behind the passengers, watching the tracks from the bubble on the roof.



German Cutter Slices Coal

The miner below operates a German coal cutter under test in the U.S. as a way of saving wasted coal. Slicing off two tons of soft coal a minute, it sneaks into narrow veins too small for conventional equipment. It pushes the coal onto a conveyor as it moves along a vein at 75 feet a minute.

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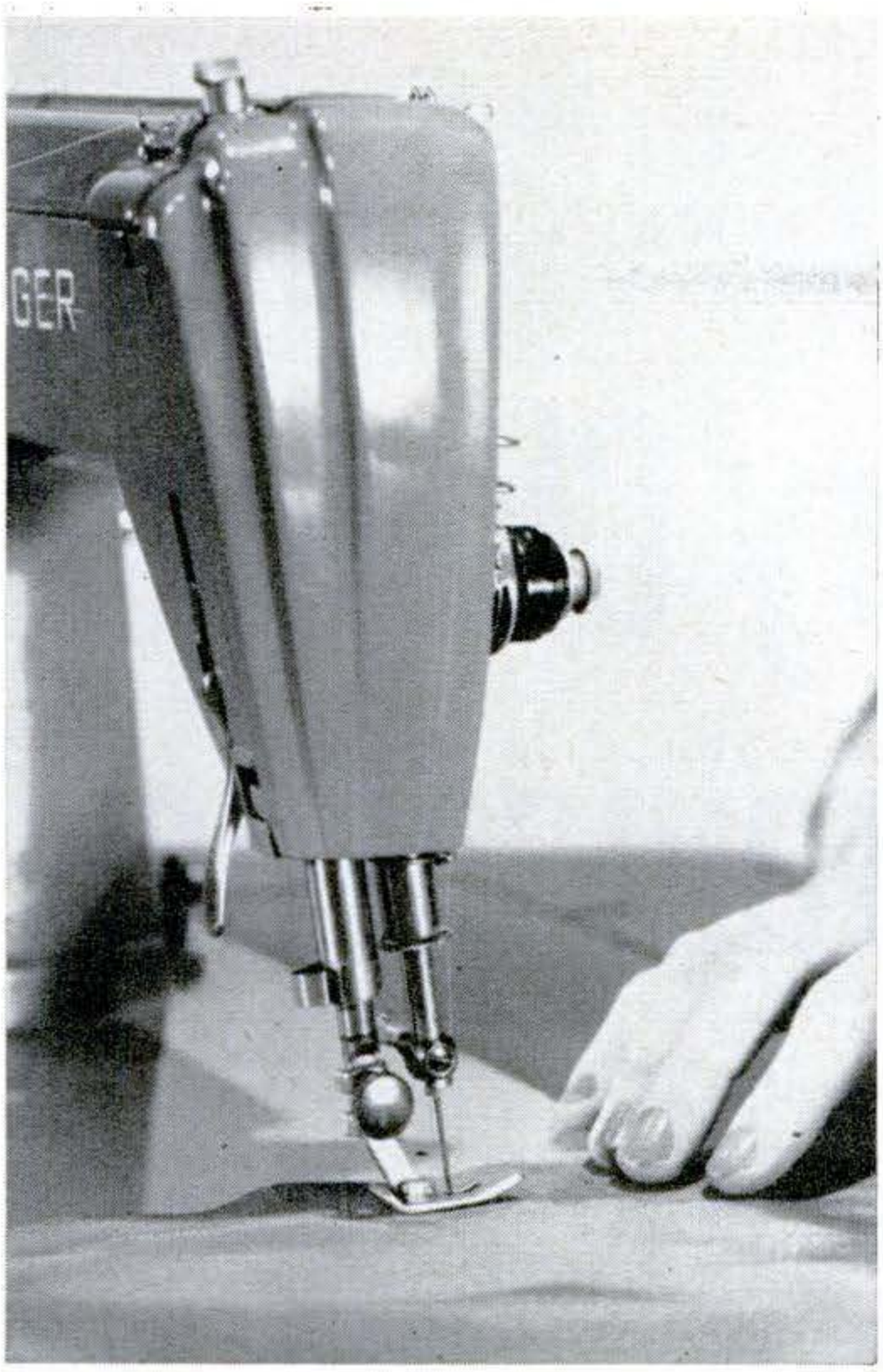


Slanted Needle Easy on Eyes

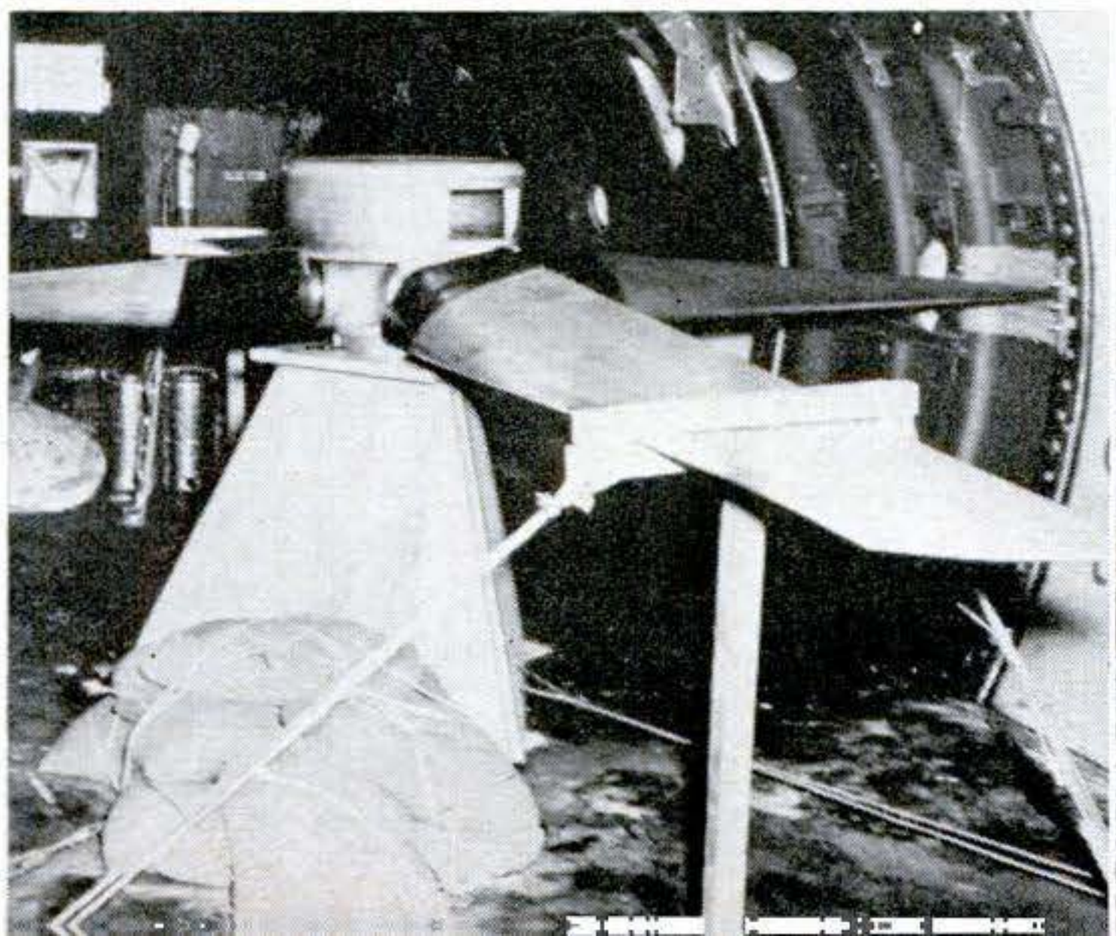
FOR greater visibility, the needle and presser bar on this home sewing machine are slanted at an angle toward the operator. The machine weighs less than 16 pounds and can be removed from the cabinet and carted off to sewing bees outside the home. Singer makes it.

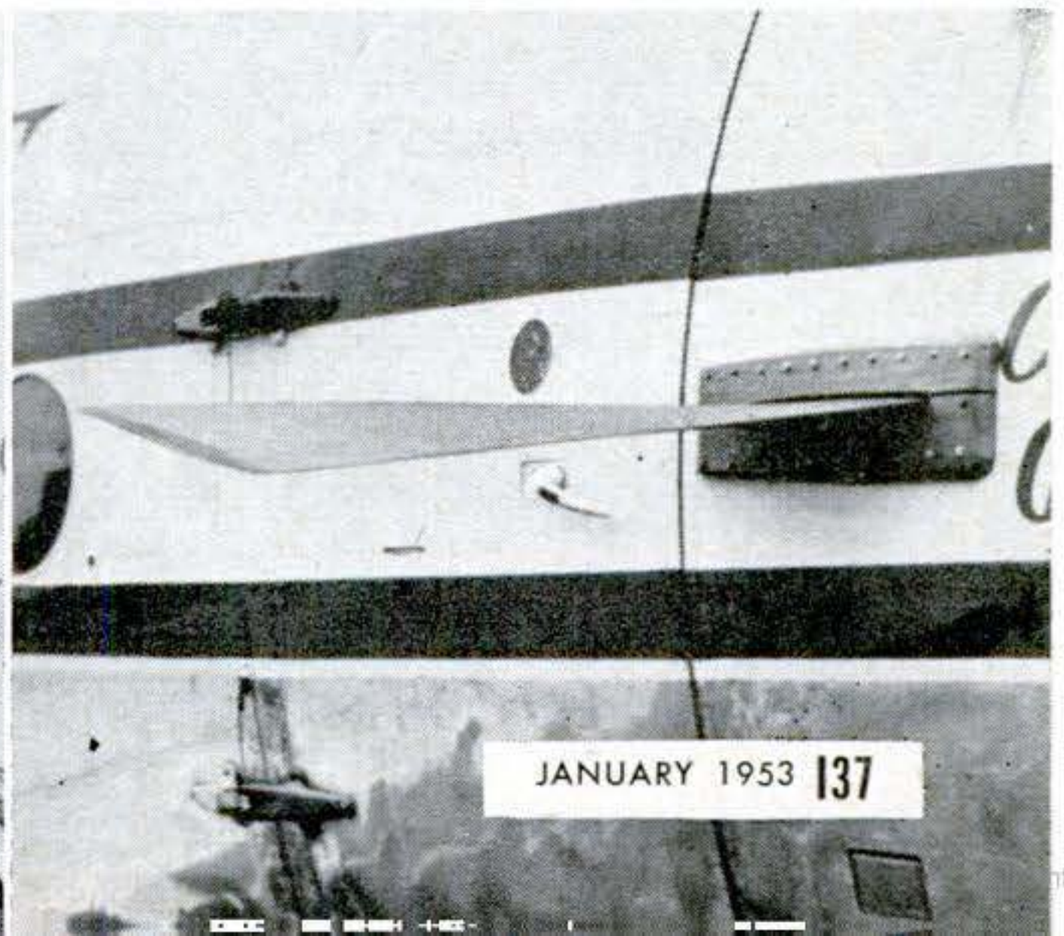
Bus's Scope Sees Over Crowd

WITH one eye to a periscope like a submarine commander, this German bus conductor can see what's happening at the exits even in rush-hour traffic. A passenger won't be carried a block beyond his stop because the bus won't be started until the periscope shows the doorway all clear.

Props Shipped Whole by Poking Blades Through Plane's Body

BECAUSE knocking down and reassembling a propeller takes three or four mechanics from six to eight hours for each operation, Peter Dunstan, maintenance foreman at Pan American's London base, worked out a gimmick to ship props ready for use. A pedestal built into a DC-4 supports the prop (left below). One blade protrudes through a slit in a door on the port side of the plane (right below). A window on the starboard side is fitted with an aluminum sheet with a slit in it to take another blade. The two tiny wings poking through the sides of the ferrying plane have no effect on its performance.





Help Wanted—Male

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Help Wanted—Male

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Industry Clamors for Trained Men

IF YOU were graduating from engineering school next June, you'd have a lot of callers coming. Industry's man hunters are already prowling from college to college. Most of them want engineers first of all. But they are also on the trail of chemists, physicists, metallurgists, geologists and other scientists.

This seller's market for science talent is big news for boys and girls who are nearing the end of high school and are planning what to do next. For not only is the demand for science talent paying off with good jobs for graduates. It is also making it financially easier for bright young people to get a science or engineering education today than at any other time in the past. If you've got the brains, don't worry about the money.

The colleges are doing a lot to help good students through school with loans and grants. The Government is lending a hand with thousands of scholarships. And American industry itself is paying out a lot of good hard dollars to ensure a future supply of the brains it needs so much.

Why so much interest in scientists and engineers? Because we're short of them—desperately. Here's the situation:

- Trained brain power has become more and more important to industry since World War II.
- At the same time, Government is drawing in specialists by the hundreds to man weapons-research and atomic-energy plants.
- Fewer engineers and scientists will graduate in June than in several years past.
- A slice of those who do graduate will be claimed by the draft.

To get the men they need, the agents of industry are ready to pay high salaries. And they have their answers ready for tough questions about company policies and opportunities.

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Colleges, corporations and Uncle Sam are making it easier for a bright student to become an engineer or scientist.

By William M. Pinkerton

But any recruiting agent for industry who starts cold this month has some surprises waiting for him. He'll meet men who've been helped through college by an aircraft company, or a foundry, or a big electrical-products manufacturer. These men don't *have* to work for their benefactor—but they're sure to feel friendly toward it when it comes to a choice.

What's more, the industrial man hunter will find that some of the smartest men in the class of '53 don't want jobs. Not at any wage. Instead, they want to study more. A year of study beyond college can mean a lot to an engineer. Another two years will put him in the top rank of his profession, with the right to call himself "doctor"—and a chance to get in on the most exciting research projects.

And an able man is pretty sure to get help for such further study. Every great university has fellowships to help pay for advanced research. The McKay Fellowships in Applied Science at Harvard, and the Guggenheim Jet Propulsion Fellowships at Princeton and the California Institute of Technology are examples.

Or a man may get help from industry itself. At a place like Massachusetts Institute of Technology, the list of fellowships for advanced study and research sounds like a roll call of American industry. The Federal Government also gives more than 600 fellowships in science and engineering.

And if the fellowship doesn't come through in May or June, today's engineering student knows that industry will still be looking for men—not only next summer but for years to come.

This is a challenge for boys who are in high school now—for it won't be long before the man hunters are after the class of '57. A boy's answer turns on two questions. The first is pretty personal: Is engineering or science the life for me? Measuring and calculating

Help Wanted—Male

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are basic in these fields. To make an engineer, you start with a mathematician. The boy who is good at geometry and algebra has the right start. He needs more: imagination—and a burning curiosity about *why* things happen.

The second, and tougher, question is: How do I get there?

Your first step is to stop thinking about "college" in general and start thinking about specific places. Should you stay home or go away? About two-thirds of the cost of college is board, room and transportation. Tuition—what you pay for being taught—is the smaller part although it looms much larger in private colleges than in state universities.

You often can do a year or two of spadework in the local college and shift to some big place to finish up. Before starting, though, you need to know whether you'll be able to transfer. Most state universities will take students starting their sophomore or junior year. Many private institutions will not, but some, like Case Institute of Technology and MIT, admit a limited number of men after two or three years in such colleges as Beloit, Oberlin and Carleton.

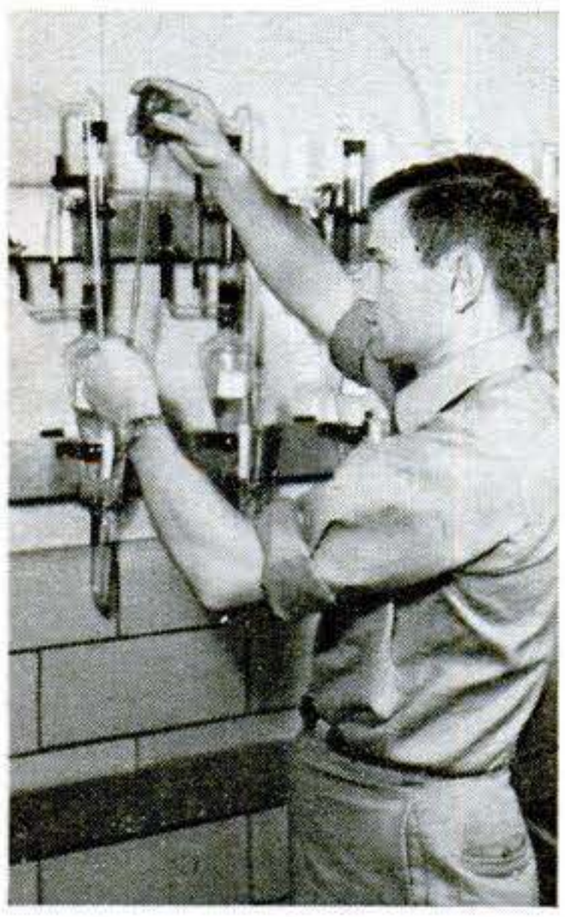
Many men travel long distances, at a real sacrifice, to get what they figure is tops. The big institutions welcome them. They want a student body that represents the best from the entire nation. To get it, they have large scholarship funds.

Most scholarships cover a year's tuition. That's $600 or more in the big private institutions. Places like Harvard, Yale and Princeton have some scholarships that pay a man's full expenses.

No college has enough money to help all its needy students. But in some institutions, one out of four is getting aid.

The big news is that, if you are The Guy, industry, too, wants to help you. Big companies started helping college graduates go on with advanced study and research a long time ago. Now, many businesses are concerned with the able high-school graduate who lacks funds to go on to college.

Suppose you are a good student, standing well up in your class, quick at math and eager for engineering. How does industry find you? It doesn't. You have to find it. Some companies place their bets through the colleges. At Carnegie Tech, for example, you might be helped by aid provided by Westinghouse. At any one of 19 major universities—such places as Columbia, Notre Dame, Washington, Wisconsin—you might get the $800-a-year RCA scholarship.



CHEMIST. Dr. Ross M. Hedrick hit the headlines this year as the co-inventor of Krilium, Monsanto's soil conditioner (PSM, March '52, p. 106). Dr. Hedrick went through the University of Illinois with the help of a state scholarship. Awarded competitively to three boys in each county, this paid four years' tuition. In addition, the National Youth Administration (no longer in existence) paid him $15 a month for the first three years. He earned most of the rest of his expenses by farm work in the summer and odd jobs in the winter. Dr. Hedrick went on to earn his master's and doctor's degrees at Indiana University with the help of a graduate assistantship, partly underwritten by the Council for Medical Research. Now 31, Dr. Hedrick has just been made a group leader in Monsanto's Central Research Dept., Dayton, O.

Be Prepared to Answer Questions

To get this kind of help, you go through the regular college offices. You apply for scholarship aid when you seek admission. You can expect the college to ask some sharp questions to make sure you really need the money. But you will

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AERONAUTICAL ENGINEER. Dr. William J. O'Donnell is chief development engineer at Republic Aviation, Farmingdale, L. I.—builder of the Thunderjet fighter. He entered tuition-free Cooper Union in New York City by competitive examination; won a $300-a-year Emil Schweinberg scholarship to help pay his other expenses by standing each year in the top 10 percent of his class. His graduate work in mechanics, which won him a Ph.D. from Catholic University in Washington, D. C., was paid for by a scholarship that supplied room, board and tuition. This was one of 25 Knights of Columbus scholarships, awarded competitively.

know when you are accepted whether you can count on financial help.

If your father works for the Ford Motor Co., you may find the help close to home. Right now, Ford is helping nearly 150 sons and daughters of employees through college. The company itself picks those it will help, using a careful scholastic-aptitude test. A boy who comes out on top is free to choose any college in the country. For four years Ford pays his tuition and fees and, if necessary, up to $750 a year expenses.

If you are going to a Long Island high school, you can ask for aid from Grumman Aircraft, which picks a number of boys to help each year. Each boy can go to any engineering school he wants. Grumman pays full tuition, and gives the boys summer jobs to boot.

The Foundry Education Foundation offers similar help primarily for men already in college and studying metallurgy. The American Institute of Steel Construction gives ten $1,000 scholarships for civil-engineering students.

New companies are developing scholarships every year. It pays to watch for them. Dr. H. Norman Feingold, an authority on scholarships, reports that one $500 scholarship in Greater Boston a few years ago was awarded without a contest. Only one boy applied.

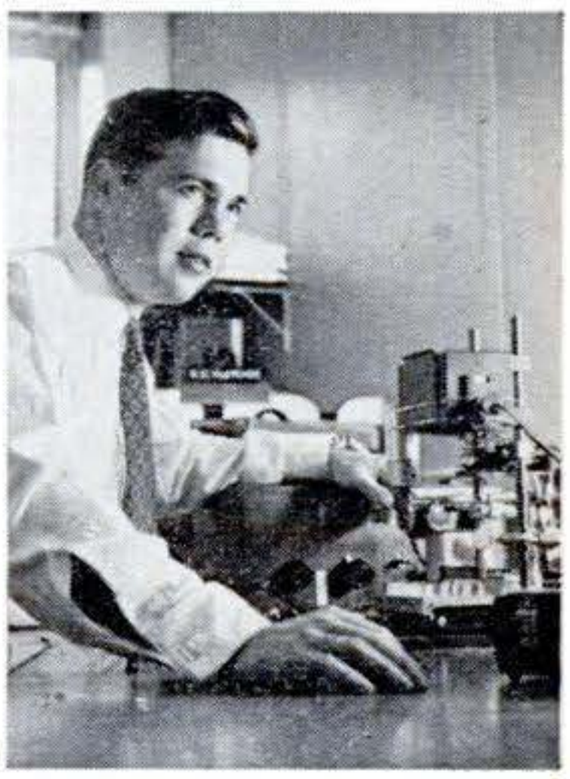
Veterans Get a Special Break

One of the best scholarships around right now is marked "for veterans only." Two years' service in the Army, Navy, Air Force, Marines or Coast Guard in the Korean War period entitles you, if single, to $110 a month for four years of college. (If married you get $135; if married with children, $160.) This is paid directly to you, and you pay all your own college expenses. In the big schools, the GI aid won't cover everything—but it will get you off to a good start.

With this veteran's scholarship ahead, many high-school graduates can use a hitch in the service to grow a little and get ready for college work. Some boys are "late bloomers." They develop slowly in high school, but spurt later. There

[Continued on page 246]

PHYSICIST. Dr. Walter L. Brown, a research scientist for Bell Telephone Laboratories, got help from Uncle Sam for his education. For two-thirds of an accelerated college course he received board, room and tuition at Duke, and $65 a month—all from the Navy V-12 program. During four years' study for a Harvard Ph.D., he drew $125 a month under the GI bill. In addition he held a $100-a-month fellowship for the first two years in return for part-time teaching. A Shell Oil Co. pre-doctoral fellowship paid lab expenses and college fees for most of the last two years. With Bell since 1950, Dr. Brown is now doing research at Murray Hill, N. J., on germanium, the element used in transistors.



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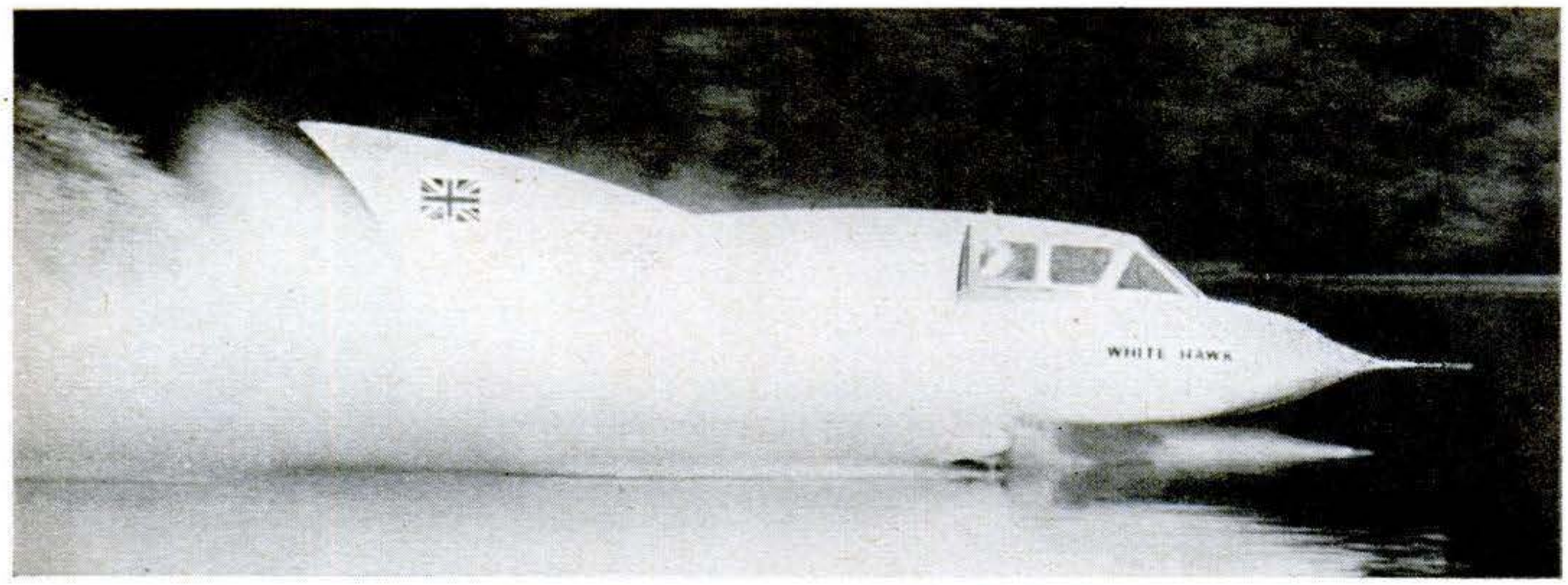


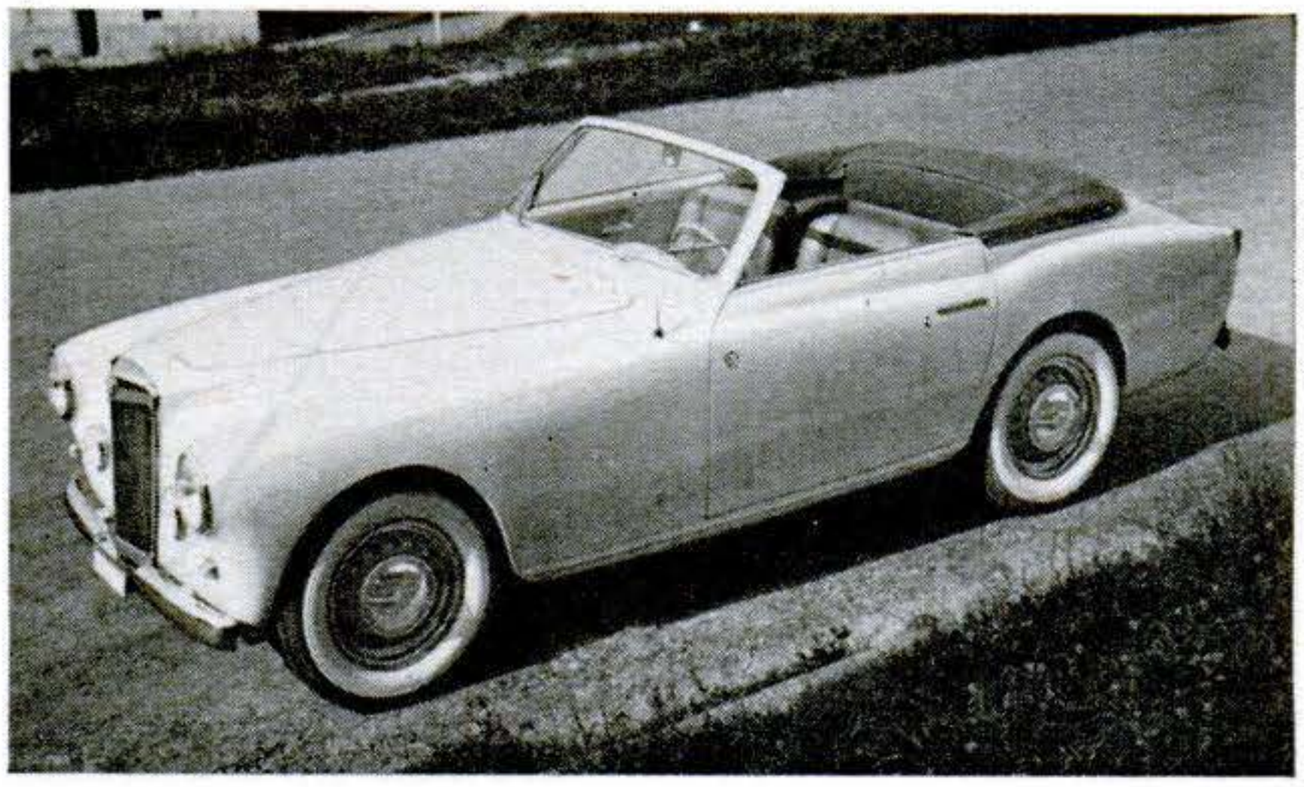
New British Jet Speedboat Aimed at 200-M.P.H. World Record

THIS jet-powered speedboat was clocked doing 90 m.p.h. during trial runs in Britain this fall. Mrs. Stella Hanning-Lee, wife of the owner of the boat, aims to drive the White Hawk beyond the record set by British speed ace John Cobb. Cobb set an unofficial mark of 206.89 miles an hour before he was killed when his craft exploded.

New Combination Family-Sports Car Grows from British MG

HERE'S a brand-new family-sports car: the Arnolt. Built on an MG TD chassis and powered by an MG engine, the convertible model at right weighs only 20 pounds more than the TD roadster, yet seats four instead of two. A hard-top model adds another 20 pounds. Bodies are built by the Italian designer Bertone.

Both cars are in the $3,500 class and are distributed by S. H. Arnolt, Chicago.



Low Camping Trailer Raises Roof to Give Standing Room

IF YOU'RE in the market for a lightweight camping trailer that won't block rear-view vision from your car, here's a tip from John Dudley of Anaheim, Calif.—build it yourself.

The body and top of the collapsible, 800-pound job below were formed over plaster molds by laminating glass-fiber cloth and plastic. After curing, the body was fitted with wheel boxes, a plywood bottom and an angle-iron frame.

The top is raised by a crank, pulling up waterproof canvas sides (right below). Inside is space for a bed, folding table, stove and cupboards.

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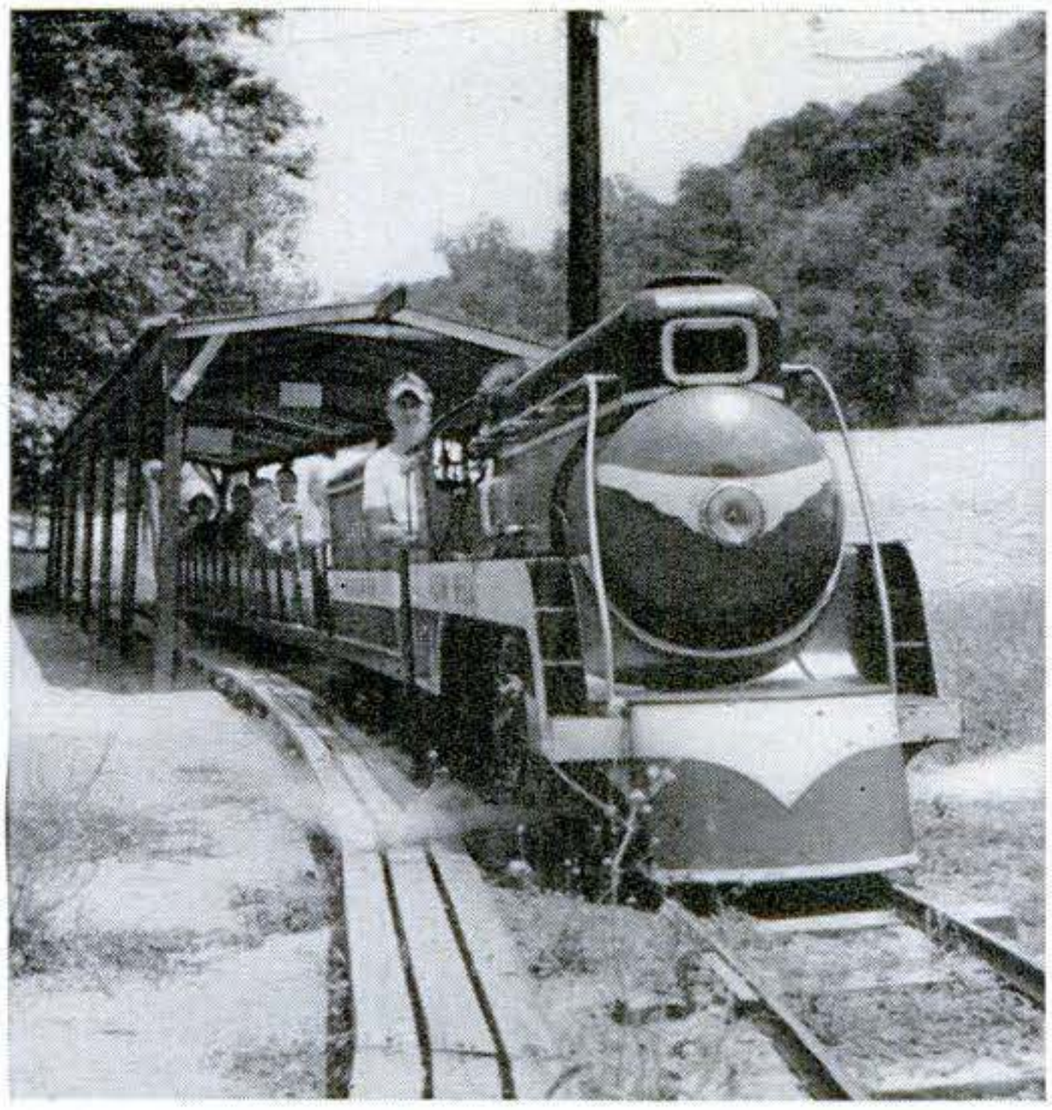
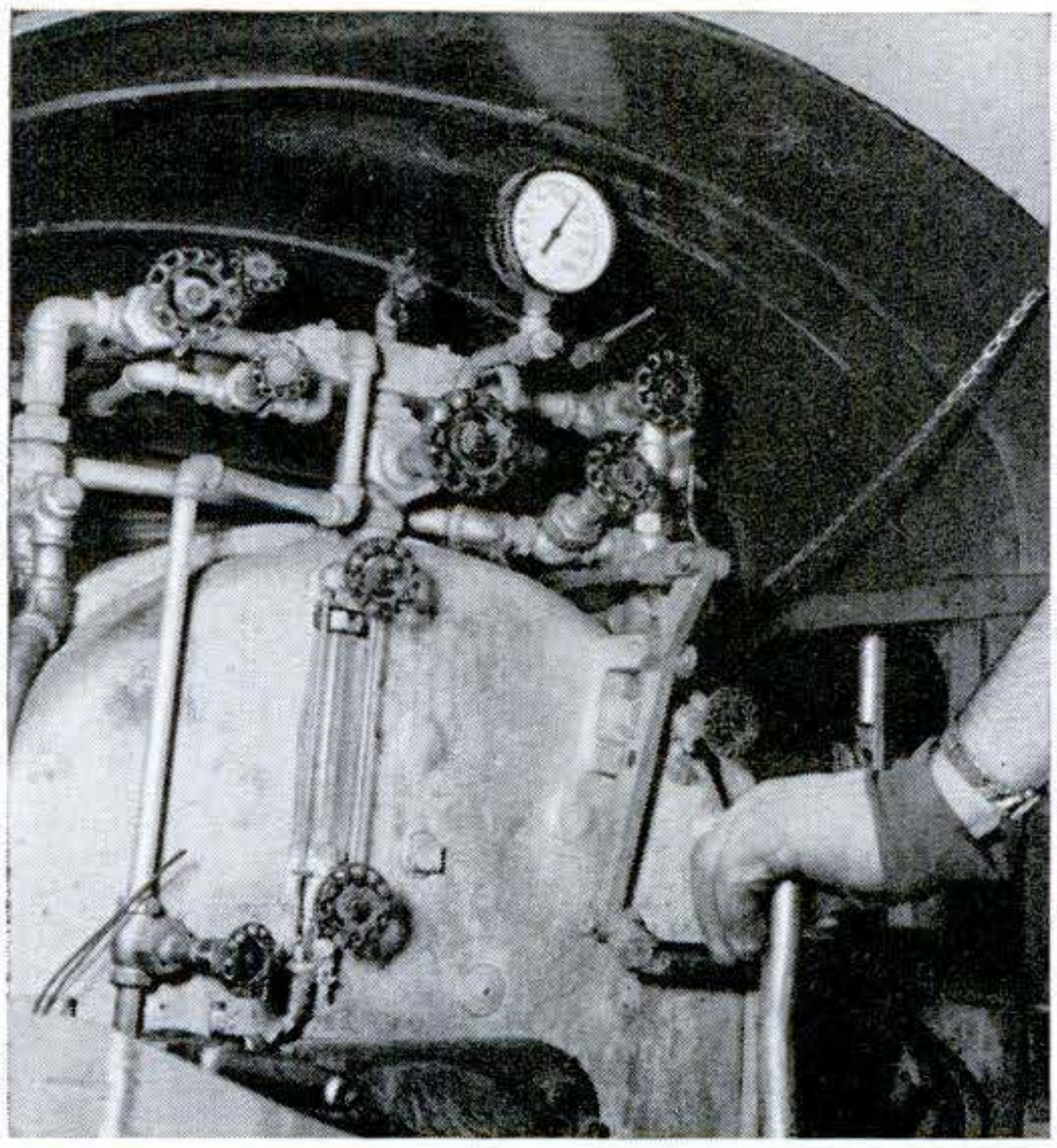


QUARTER-SCALE LOCOMOTIVE, drawing a tender and two cars, leaves terminal of Santa Ana Canyon Miniature Railroad. Red, white and black train is named Victory Special.

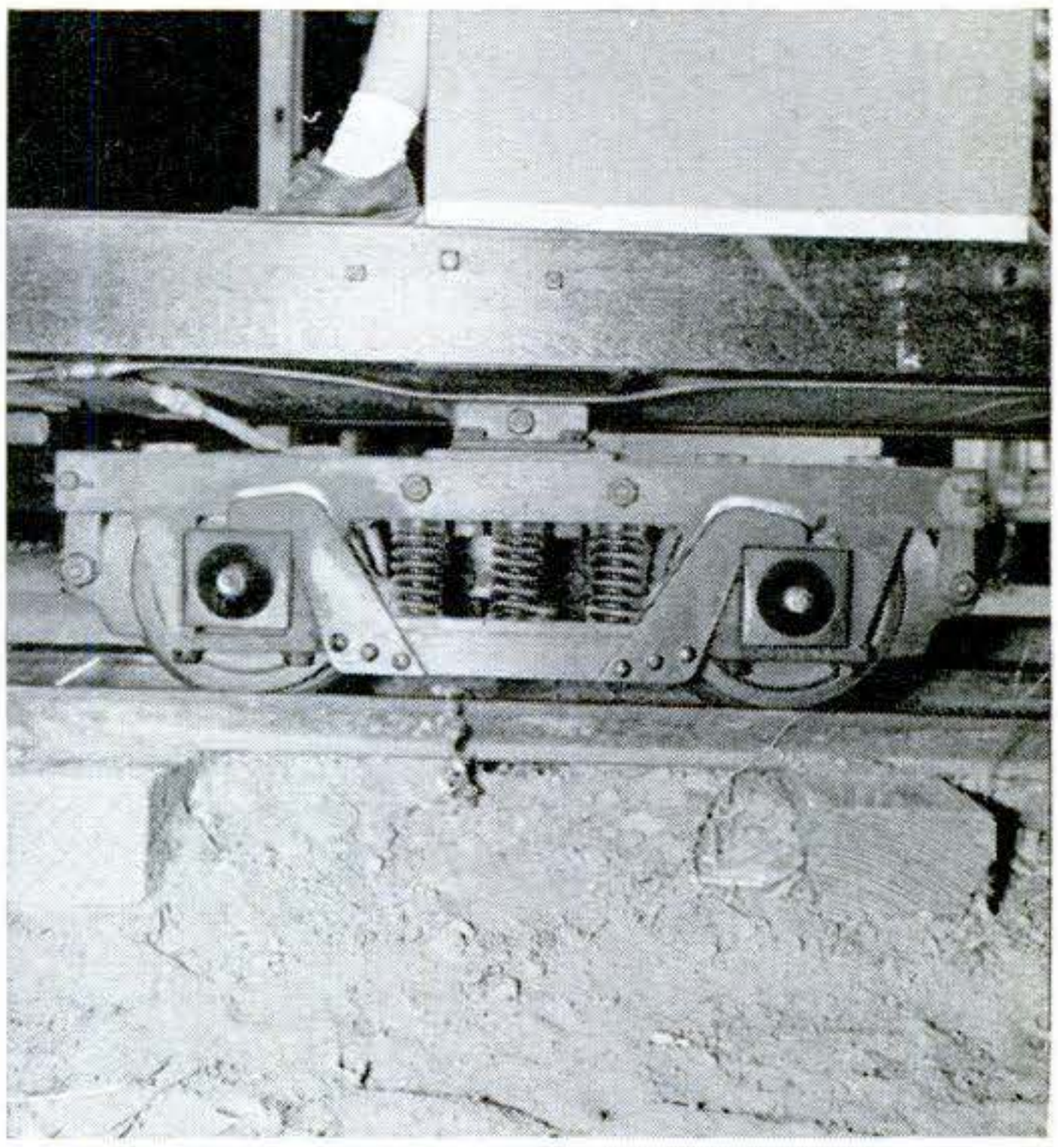
Family Runs Own Railroad

DRAWN by a miniature steam locomotive, this two-car train delights a load of kids by starting with a whistle blast, hitting 20 miles an hour, ringing a bell at a crossing, and rumbling through a tunnel. It gives ticket-buying passengers a mile-long ride through Santa Ana Canyon, Calif., and back to the starting point.

A family-owned enterprise, the line was built by Philip Martin of Los Angeles, a toolmaker at the Baldwin Locomotive shops prior to his recent death, and his wife. Currently Phil Martin Jr. acts as the train's engineer and a son-in-law, George Hale, lends a hand.

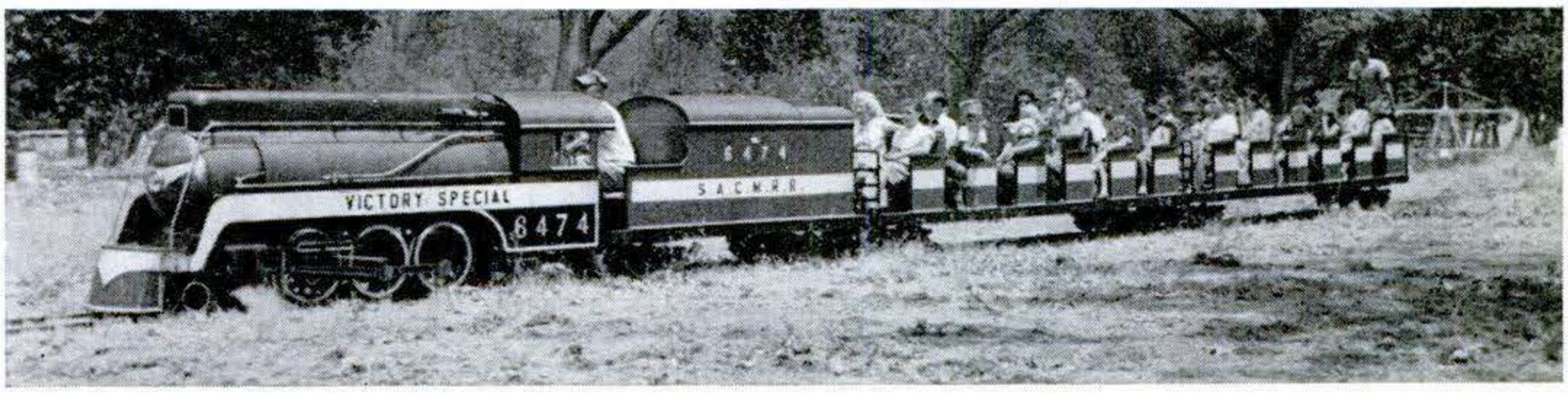


CAB OF ENGINE, like over-all design, is reduced-scale version of Norfolk & Western's Pacific type. Firebox burns three gallons of oil hourly to make steam for hauling train.



SPRINGS IN CARS' TRUCKS came from valves of Diesel-truck engine. Miniature 18-inch-gauge line has mine-railway rails, fastened with spikes to four- by six-inch wooden ties.

Highballing along straightaway part of its run, Victory Special hits top speed of 20 m.p.h.



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What's New on the Range

1. Controls Are at the Back. Little fingers can't reach to the back of this stove to turn on the gas. But set on top of the back panel, the knobs are easier for the cook to see and use. The stove also has a Dutch oven big enough for a roast and a chrome broiler tray that goes right to the table.

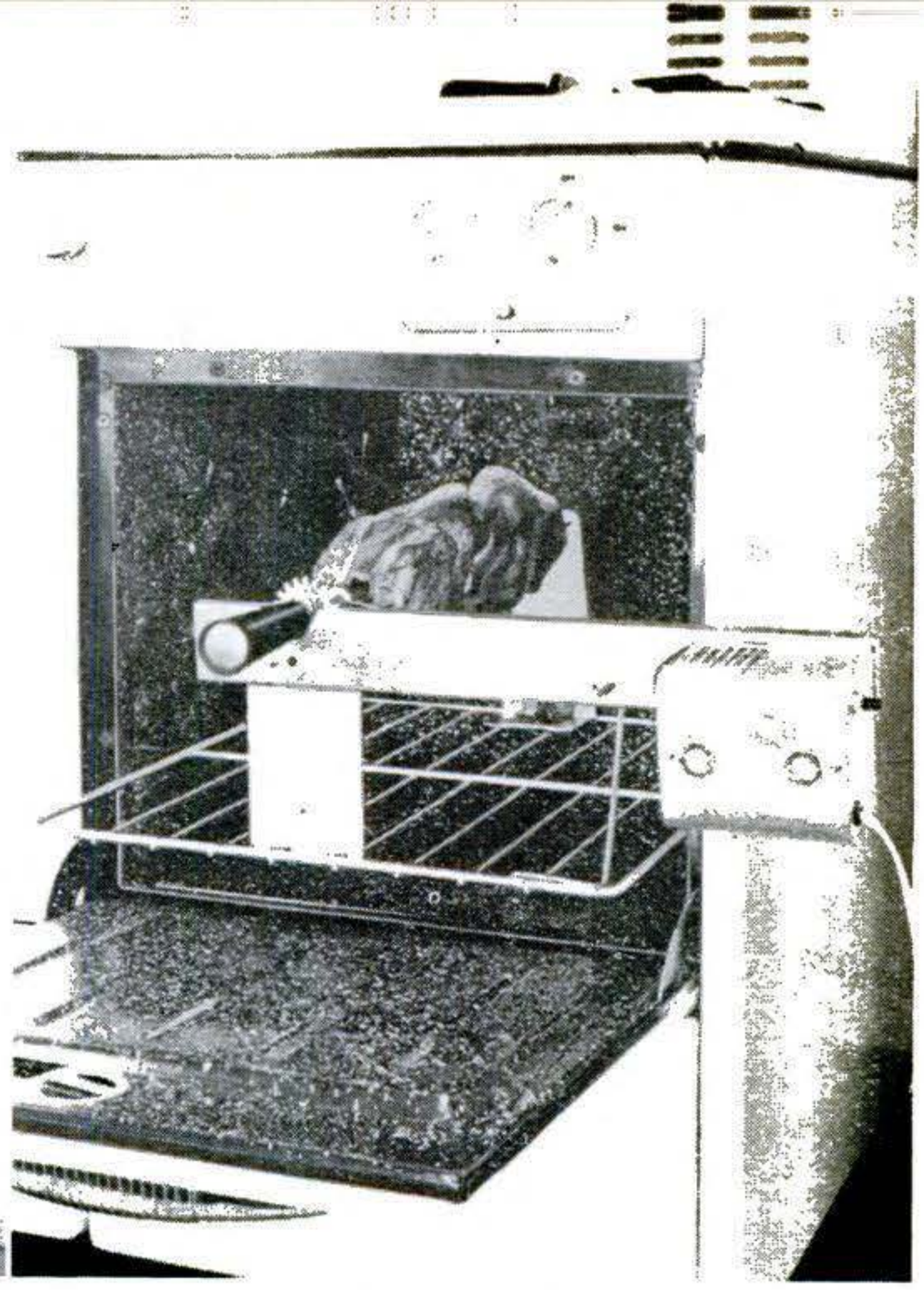
4. Safety Knob. This control turns on the stove only when pressed in firmly so teeth mesh. Once stove is turned on or off, knob returns to safe position. For gas or electric ranges.

5. Door Lifts Off. With the door removed, it's a cinch to clean the back of this oven. And the whole front is exposed. You can slip the door out and hook it back on without tools.

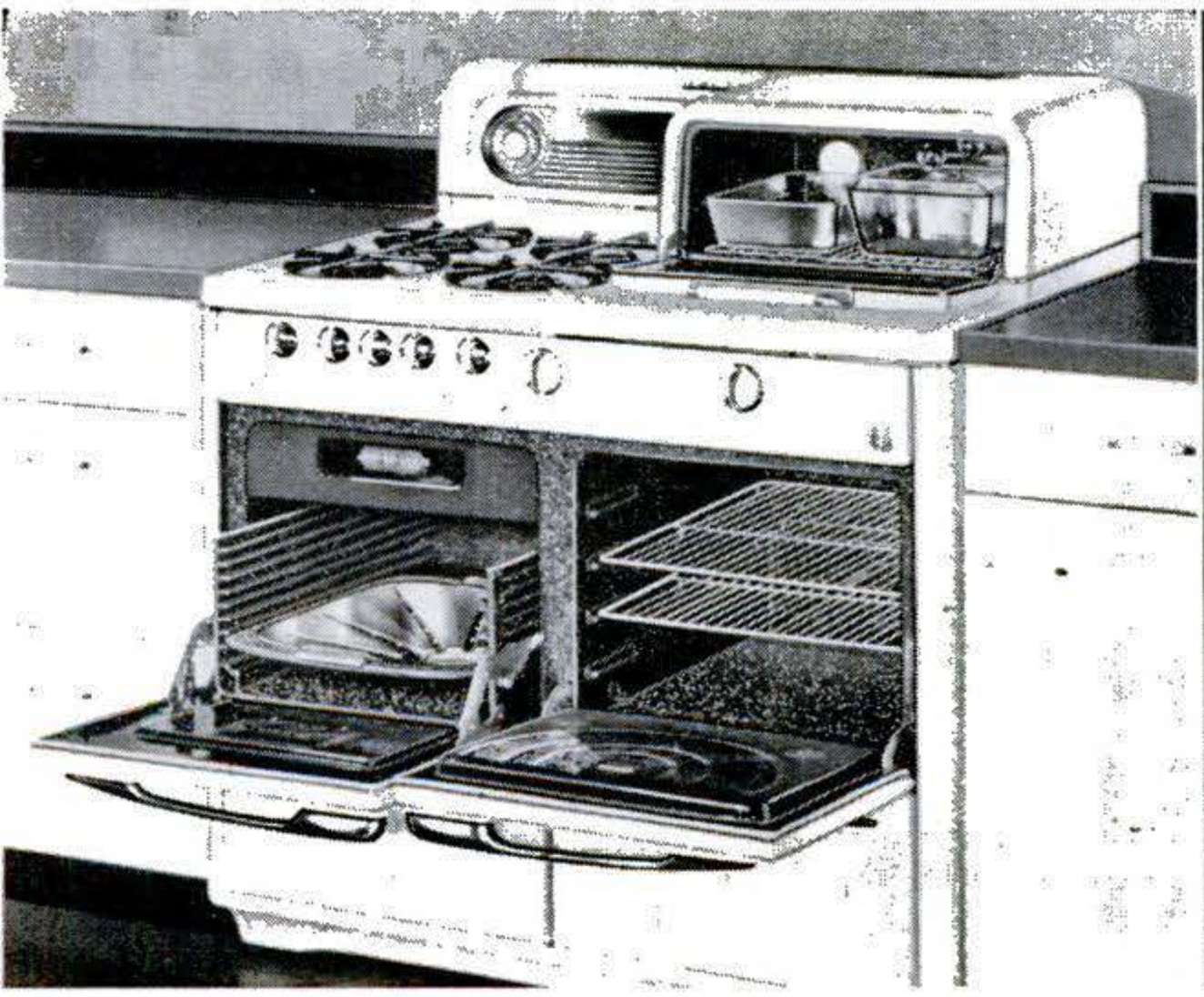
6. Foot Opens Broiler. Toe pressure on a pedal brings this broiler out to view. Drawer opens to full length of pan so largest steak can be turned without interference from range.

Copyrighted material

2. White All Over. Lined with white porcelain and fitted with removable rack guides, the oven of this range is as easy to clean as a china bowl. An electric range, it also has a food-warming drawer heated by a 1,000-watt thermostatically controlled unit.



3. Indoor Barbecue. Any electric stove becomes a barbecue with this rotisserie. It will spit a turkey or a haunch of venison weighing up to 25 pounds. It works on AC, can be set up or taken down in minutes and is said to cut one-third off cooking time.



7. Topside Oven. The baby oven on top will often serve in place of its big brother and save gas. The broiler at left of the regular oven has a metal grid heated by the burner for radiant cooking.

8. Pick a Pan. Hiking cross-kitchen for a skillet or juggling a lot of nested pots to get one are chores the cook at this range can forget. Two compartments store pots and sliding racks bring the right one to hand.

Further information on these products can be obtained from: 1. The Maytag Co., Newton, Iowa; 2. Perfection Stove Co., 7609 Platt Ave., Cleveland 4, Ohio; 3. Rotiss-O-Mat Corp., 22-15 Steinway Ave., Long Island City, N.Y.; 4. Patent Button Co., Knoxville, Tenn.; 5, 6. Tappan Stove Co., 250 Wayne St., Mansfield, Ohio; 7. Geo. D. Roper Corp., Rockford, Ill.; 8. Norge Div., Borg-Warner Corp., Detroit.

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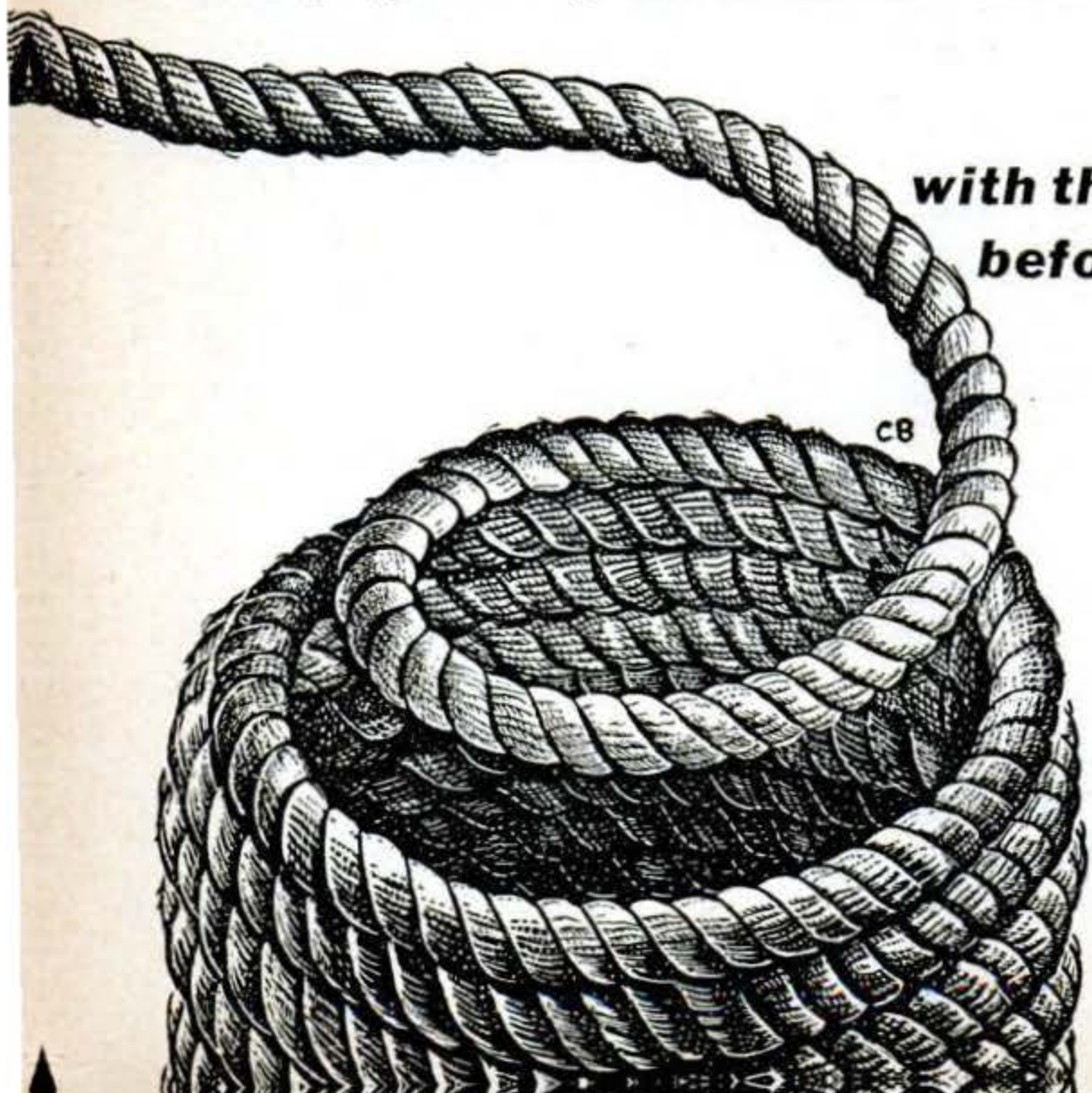
Seascape painted by one of the crew on a recent expedition captures the lonely desolation



When a 100-ton monster is tagged with this high-voltage weapon it's all over before the whale knows what happened.

By William McGaffin

"THAR she blows!"

The lookout in the crow's nest cries out as a column of condensed vapor pokes above the distant antarctic horizon. "Thar she blows, thar she blows," echo other lookouts.

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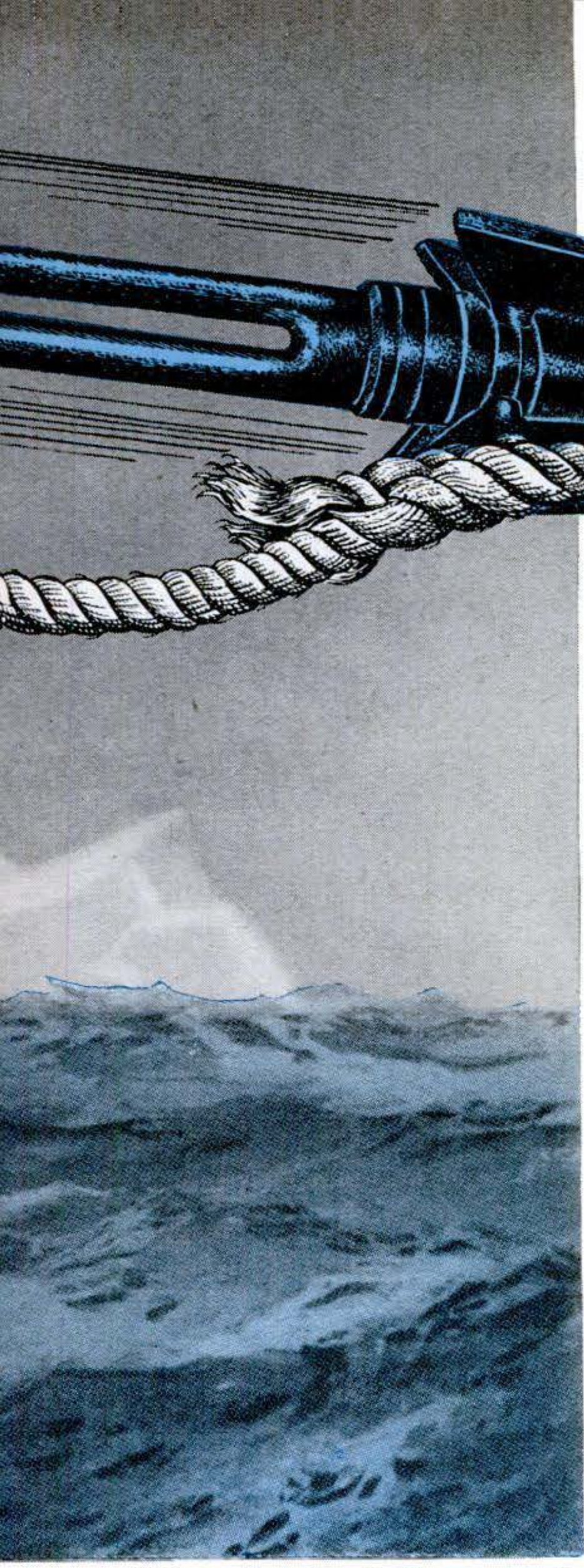
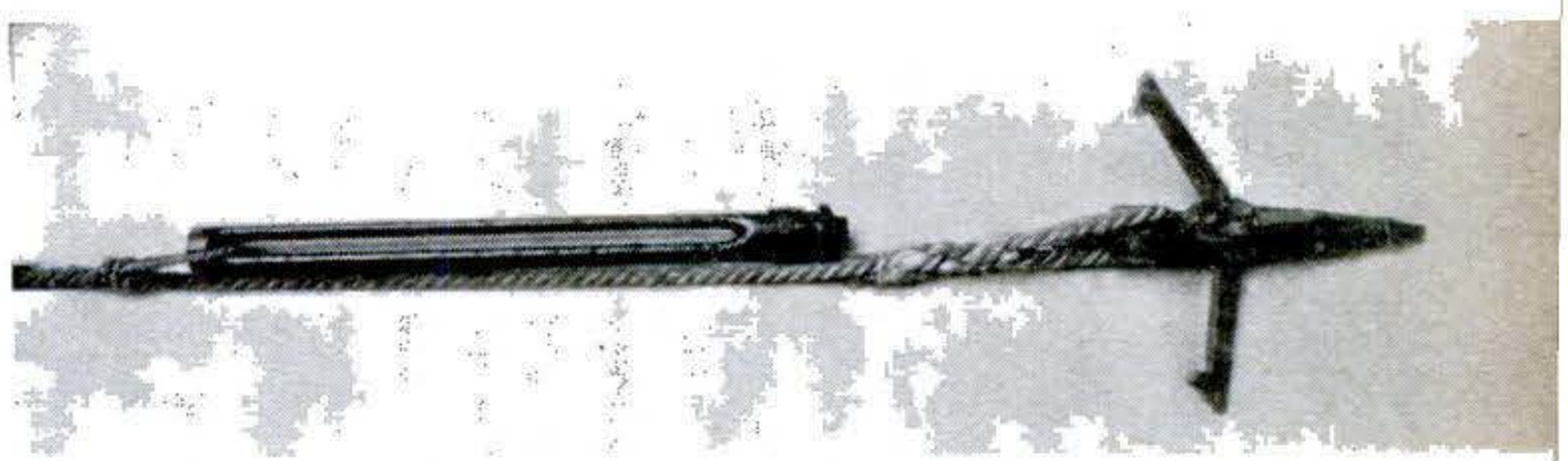
New Harpoon Electrocutes Whale in Two Minutes



of the antarctic whaling grounds.



CLOSE-UP OF ELECTRIC HARPOON shows head open as it is when lodged in the whale. The shaft is detached upon impact to prevent current leaking out from it into sea. Harpoon at top of page is in firing position.

The whale is seven miles away. Quickly the gunner reckons her course and steers his little catcher boat to be nearer the next time she comes to the surface to blow.

Twenty minutes later the huge baleen—big as a big house—comes up again. The boat is closer to her now and she is frightened.

She may dive again. But the gunner is unconcerned. Though her powerful body can streak underwater at 20 knots, the whale is an air-breathing mammal. The faster she runs, the sooner she must come up to blow and refill her lungs. The old-time harpooner had to be rowed within hurling distance before she dived, but today's whale hunter rides a fast, steam-powered catcher boat and shoots from many yards away. He can bide his time.

When the gunner thinks he is near enough, he runs down the catwalk to the gun platform in the bow. With arm signals—antarctic wind makes shouting futile—he directs the helmsman. Maintain-

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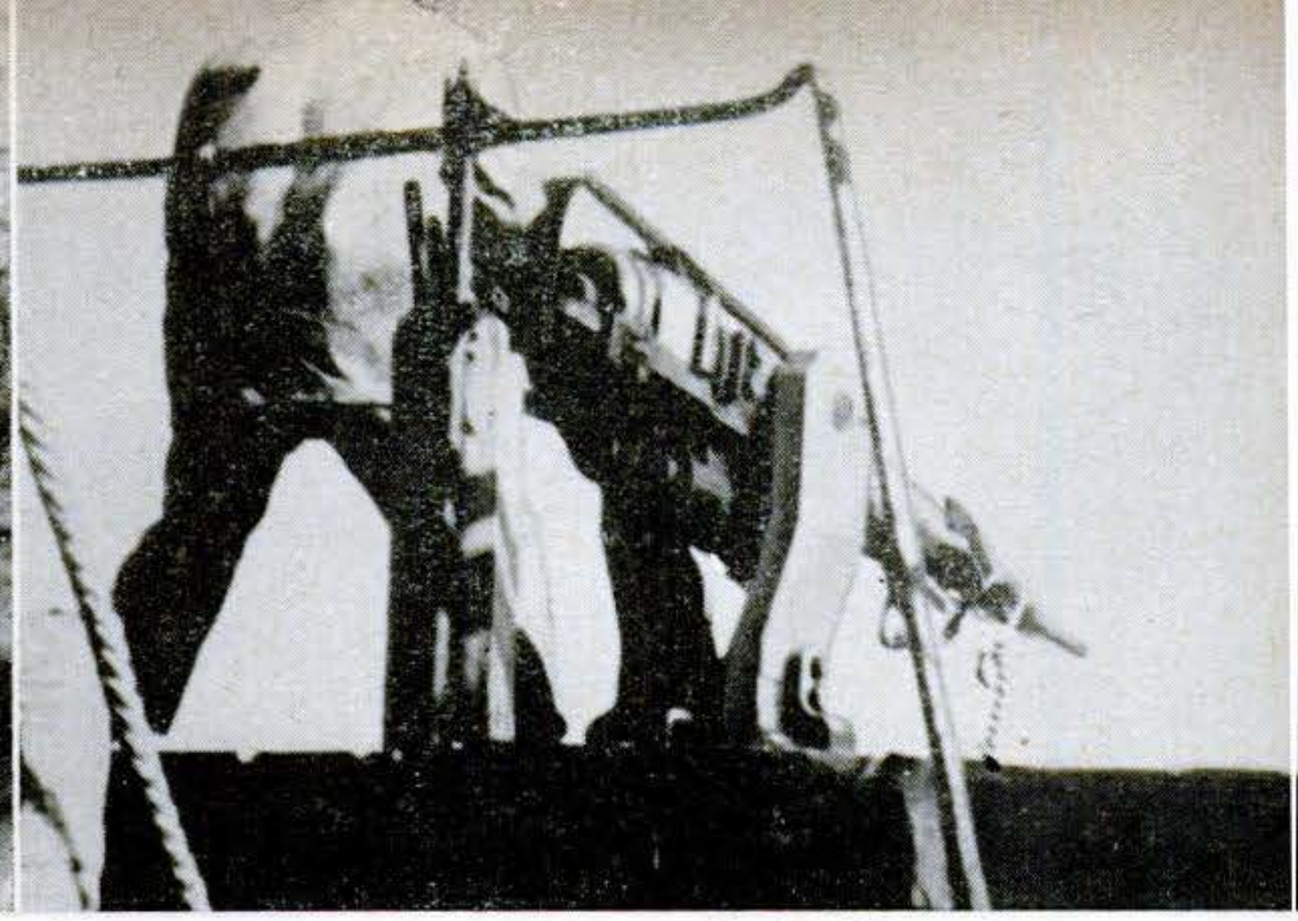
1 THE QUARRY IS IN SIGHT. Bundled up against the bitter cold, the gunner stands ready as the catcher boat closes in on the whale, most of whose vast bulk is hidden below the waves.



2 THE GUNNER TAKES AIM with the Kongsberg gun, also used to fire the grenade harpoon. One advantage of the new harpoon is that it can be fired from any type of whaling gun.

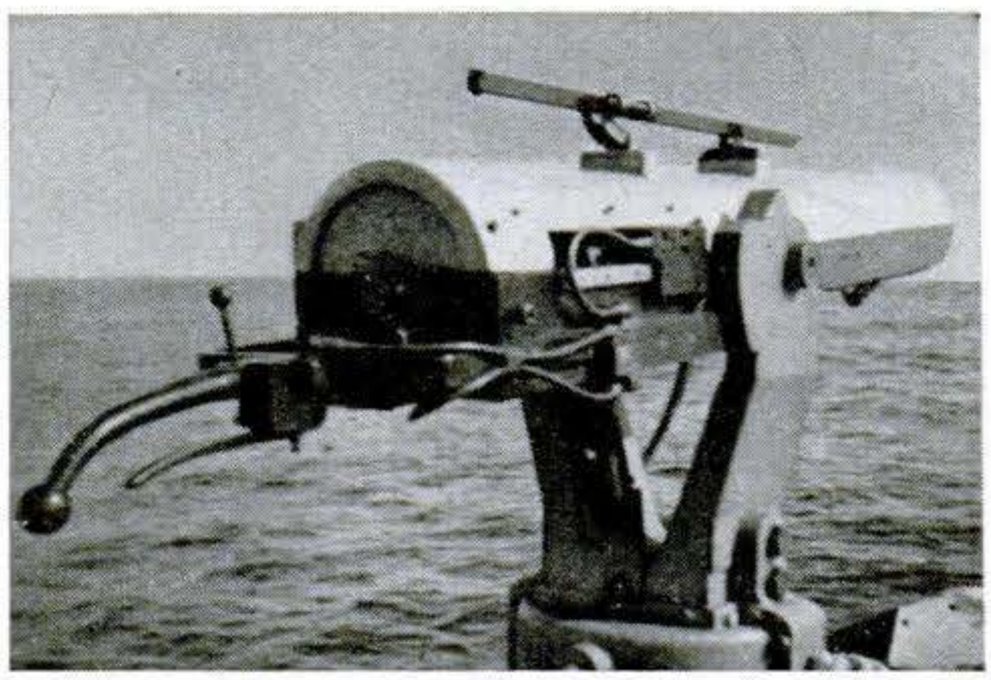
ing a precarious balance as the little boat heaves and plunges, he aims the harpoon.

He can see only about 10 feet of the whale. The rest of her 100-foot length is hidden beneath the surface. And in 3½ seconds she will dive again.

He pulls the trigger, and in three-quarters of a second the harpoon strikes. Electricity shot through the waterproofed rope attached to the harpoon then kills the whale in about two minutes. The lethal current comes from a dynamo in the hunting ship and is controlled from a box on the bridge.

This is the new, humane way to kill a whale. Most whales are still being hunted with grenade harpoons, set with time fuses to explode inside the whale.

If a whale is hit in the heart or some other vulnerable spot with a grenade fuse, she dies. But if not, she fights like a tuna and has to be played. She may sound, go down 200 yards, or race away on the surface, towing the catcher boat. Her death struggle may last from 40 minutes to two hours.



THE NEWLY DEVELOPED SPIGOT GUN fires a smaller harpoon (2½ feet, 100 lb.) than the Kongsberg gun. Note trigger under the handle and bar sight on top of the barrel.

With the new electric harpoon, experimenters believe, the average time required to kill a whale and tie it up alongside the catcher boat will be cut to 10 minutes.

With grenade harpoons, the average time is 50 minutes.

Old salts have admitted that if they could hear the cries of whales pierced with grenade harpoons they would never go to sea again. Whales can communicate with their mates underwater but make no sound audible to human beings above the water except the snorting noise when they blow.

There are economic as well as humane reasons, however, for the interest of whaling men in the new harpoon. With it, the hunting season can be shortened, and the high cost of financing a whaling expedition to the antarctic can be reduced. With it, too, the products can be better preserved. Some of the meat is spoiled when a grenade is exploded inside a whale.

A patent on an electric harpoon was applied for in London nearly half a cen-

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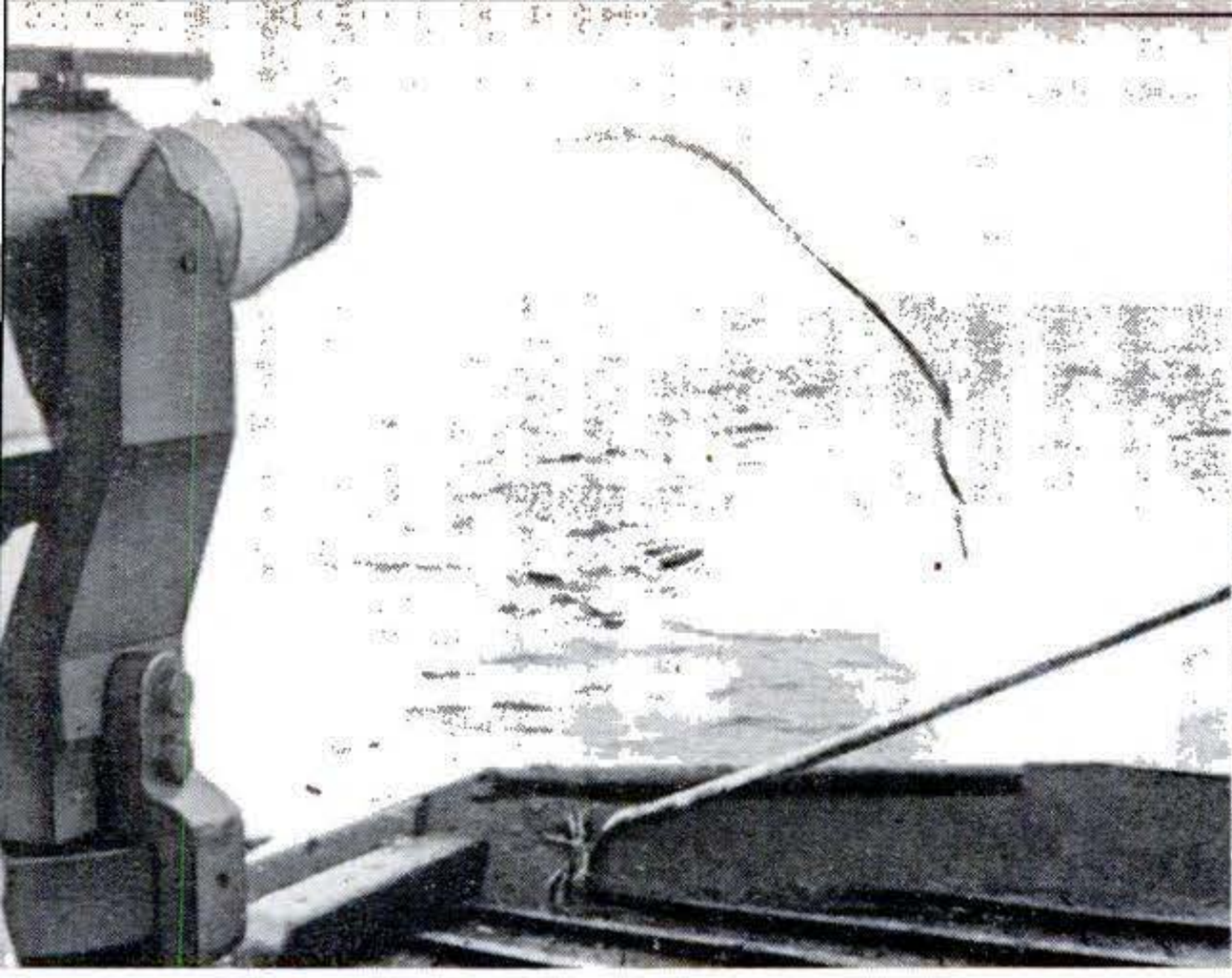


3 THE GUN IS FIRED and the 180-yard nylon forerunner, electrified with 250 volts at 50 cycles, spins out behind the four-foot, 140-lb. harpoon. It strikes in less than a second.

4 DEAD WHALES ARE TAKEN IN TOW. Once a whale is killed, it is winched alongside the catcher boat and inflated with air to keep it afloat on the way to the factory ship.

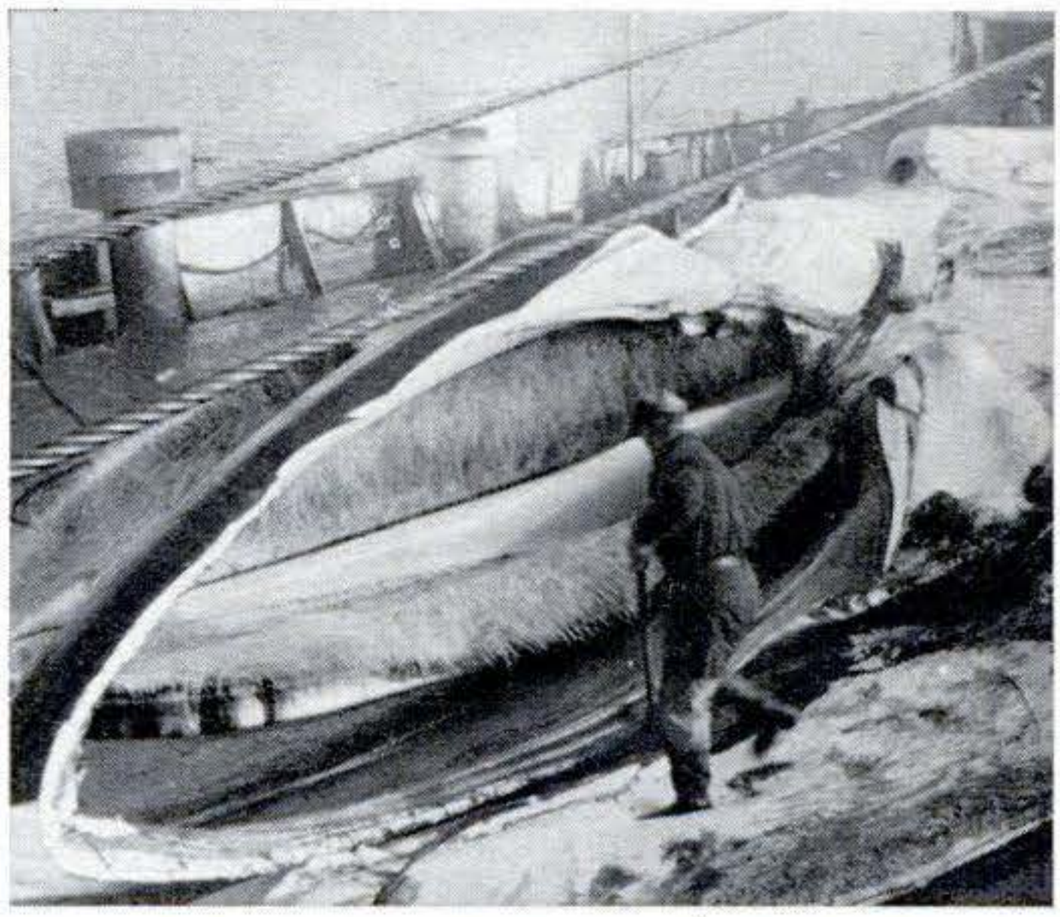
tury ago. But not until 1929 was such a harpoon used successfully. Dr. Karl Webber, a German engineer, then electrocuted four whales off the Norwegian coast. And since the war a new effort has been made in Britain and Norway by United Whalers, Ltd., cooperating with the General Electric Company of England and other concerns, to perfect an electric harpoon.

Biggest Whale Killed

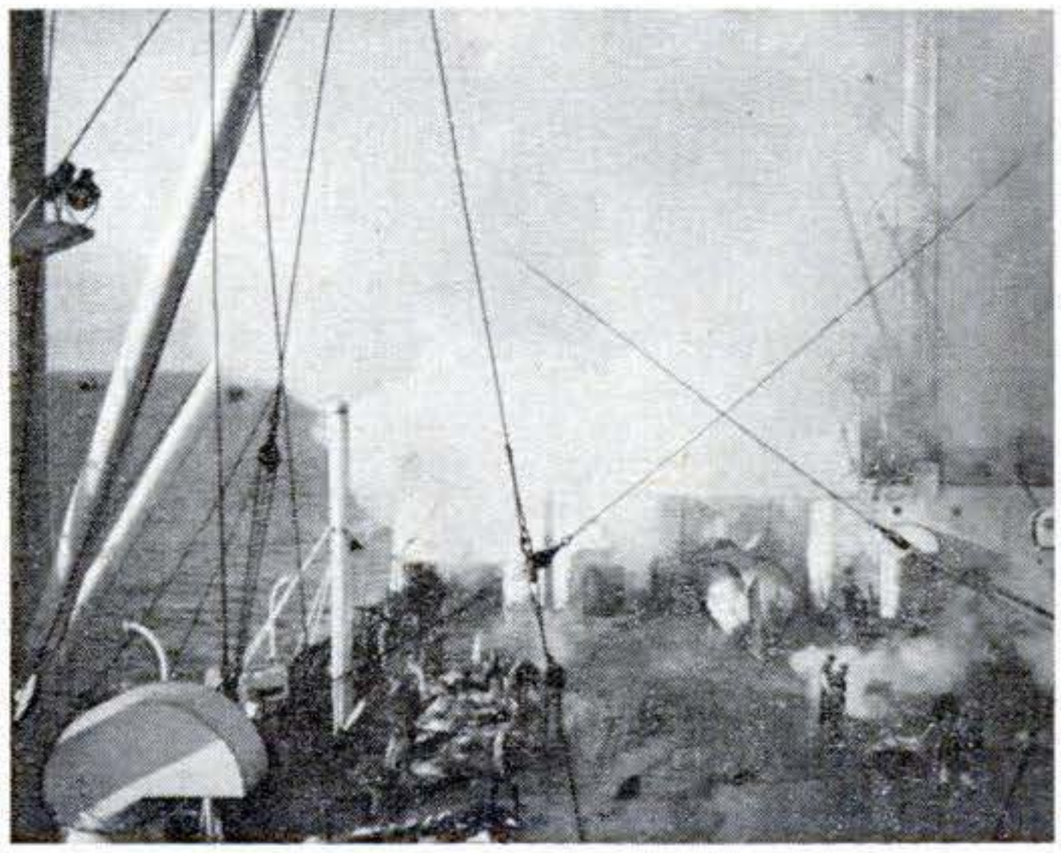
Sir Vyvyan Board, the 68-year-old chairman of United Whalers, became so interested that he went down to the antarctic two years ago to live as a gunner and fire the experimental harpoon himself. With him went Robert Marsden, 50-year-old technical expert of the General Electric Company of England.

One of their problems was to perfect a rope. Pinelli-General Cables of Southampton, England, helped find a way to put a conductor in a nylon rope. About 200 ropes were built and tried before one that would carry the conductor satisfactorily was developed. It will stretch 45 to 50 percent under strain without breaking, and then return to normal.

Six experimental expeditions have now been conducted by Sir Vyvyan and Marsden since their antarctic trip. On their most recent trip, off the Norwegian coast, they killed the largest whale of the season. And on their return they told



5 THIS IS A WHALE'S JAWBONE on the factory ship's huge "flensing" deck. Here the whale's foot-thick blubber is stripped off and dropped below for cooking into whale oil.



6 CLOUDS OF STEAM rise up from below decks when the processing vats are opened.

Photos from General Electric Co. of England, and United Whalers, Ltd.

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this correspondent, "The principle of electric killing is established to our satisfaction, but its application requires final adoption on the whale catchers and necessitates training present-day operators in the new system."

More of the United Whalers boats will be equipped with electric harpoons for the baleen whale season that begins January 2, 1953, but the whaling industry is one of the most conservative in the world and will not abandon grenade harpoons overnight.

In the last 100 years there have been only two big changes in this adventuresome business:

- The gradual introduction of the grenade harpoon, invented by Svend Foyn, between 1864 and 1873.
- The appearance of slipways on the factory ships in the 1920s. Until these were adopted whales were made fast alongside, as in the days of Moby Dick, stripped of their blubber and then left to sink.

SIR VYVYAN BOARD, chairman of United Whalers, went along as a gunner on an expedition to Antarctica two years ago.

The electric harpoon will be just as revolutionary. Traveling 400 feet a second, it is faster than a grenade harpoon, which has a higher trajectory and an effective range 20 yards shorter.

The Kongsberg, Bofors or any other gun now used to fire the grenade harpoon can be switched over without modification to firing the electric harpoon. The only difference is in the length and weight of the harpoon.

The adoption of a more humane harpoon, however, will not make a whaling expedition a pleasure cruise. During the past summer, the United Whalers fleet put in for repairs at ports in England, Norway and South Africa. In October it sailed to assemble at Capetown. From there it is proceeding now to the antarctic through the roaring forties and the even more ferocious fifties. At 52 to 53 degrees south latitude, it will begin to see floating ice and albatrosses. At 58 degrees, it will encounter the icebergs.

This fleet is a modern armada consisting of:

- A 20,000-ton factory ship with a crew of 500. The whales are carved up on this and their blubber is cooked into oil.
- A refrigerator ship that receives the fresh whale meat as it is carved off the killed whales and freezes it for shipment home.
- A nursemaid tanker that supplies fresh water, fuel oil and equipment to the catchers.
- Seventeen little boats —some of them 500-ton catcher boats or killers, some 350-ton buoy or tow boats.

The catcher boats are low in the water, to make it easier to bring a whale alongside. But this also makes it easy, on decks constantly awash, for a man to be washed overboard—and a man can't live five minutes in the antarctic water. On a recent expedition a man came out from dinner one night and decided to take a chance walking the deck that was awash instead of climbing to the upper deck. He was swept overboard and never seen again. On another expedition, three years ago, the helmsman turned the boat too sharply when it was being towed by a whale. The boat capsized and all 16 men on board were drowned.

Summer is a strange word for the weather the whalers encounter when they begin their hunt in January. The sun never sets then in the antarctic. There is only a gloomy dusk for three hours each day when the sun hangs low on the horizon. The men work a 19- to 20-hour day on the catchers, and 12

[Continued on page 242]

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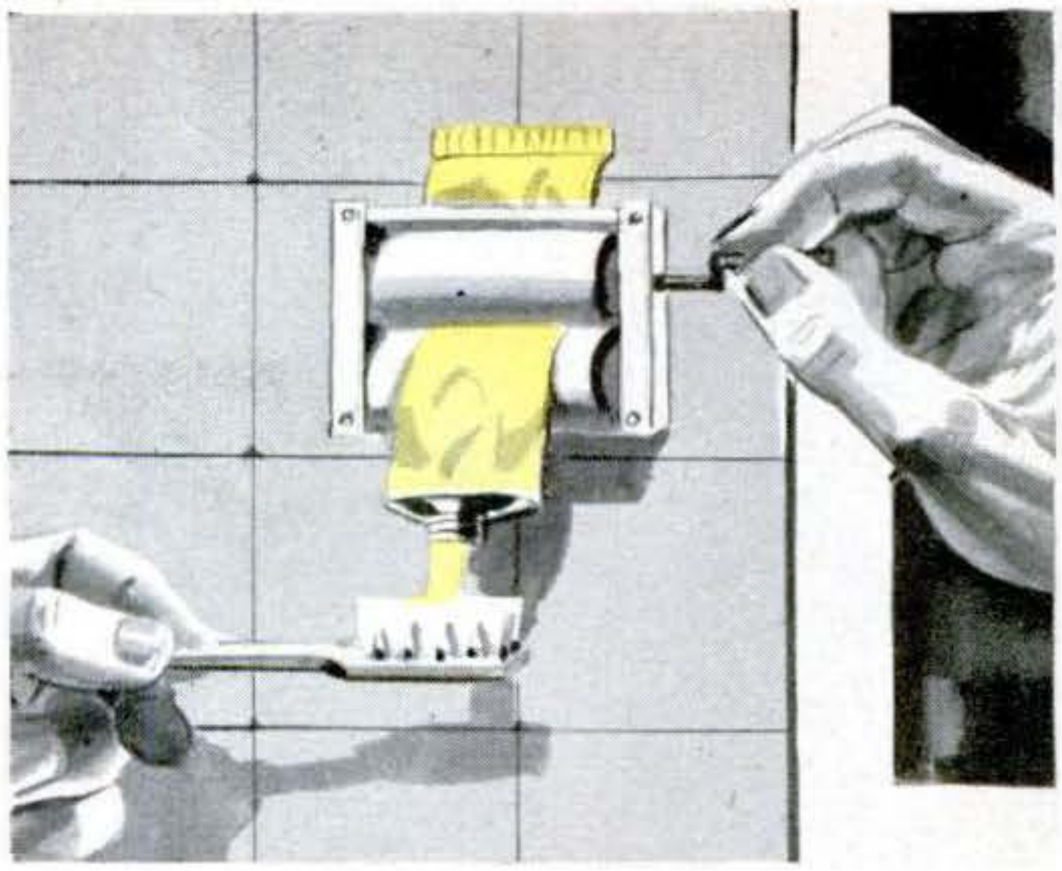
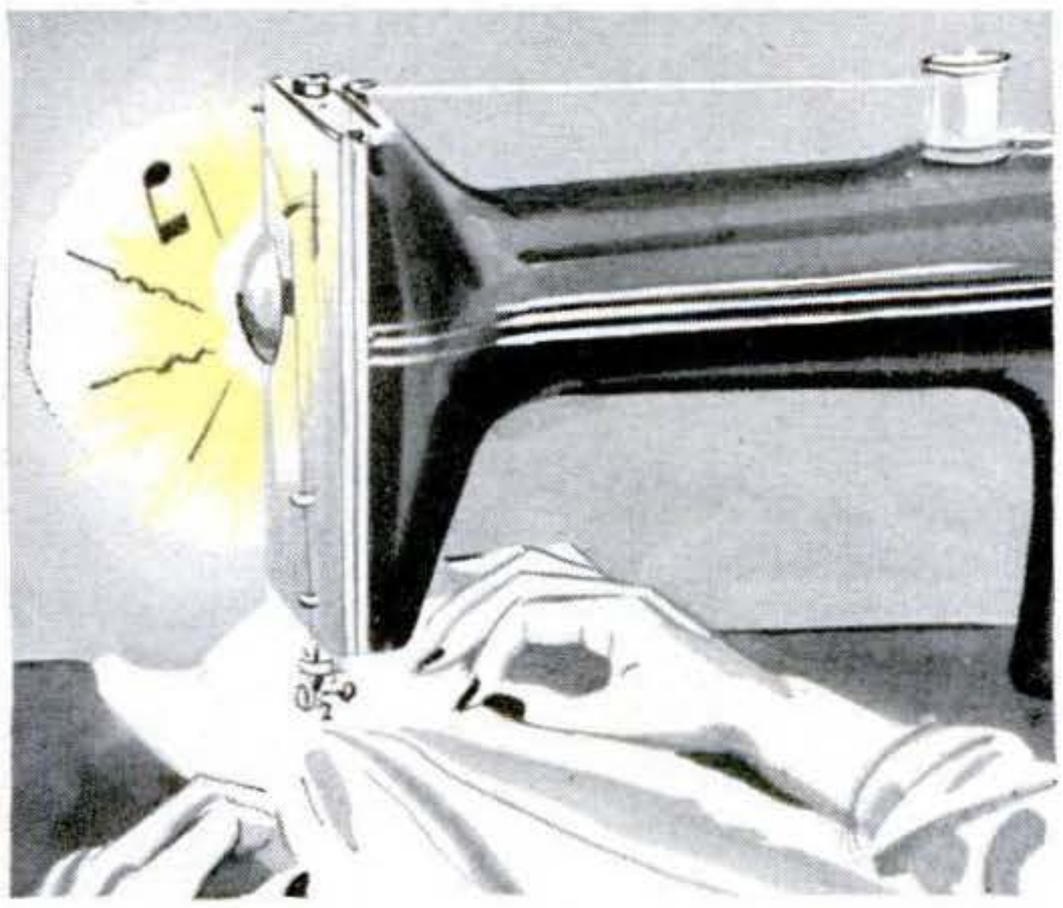
I'd Like to see them make...

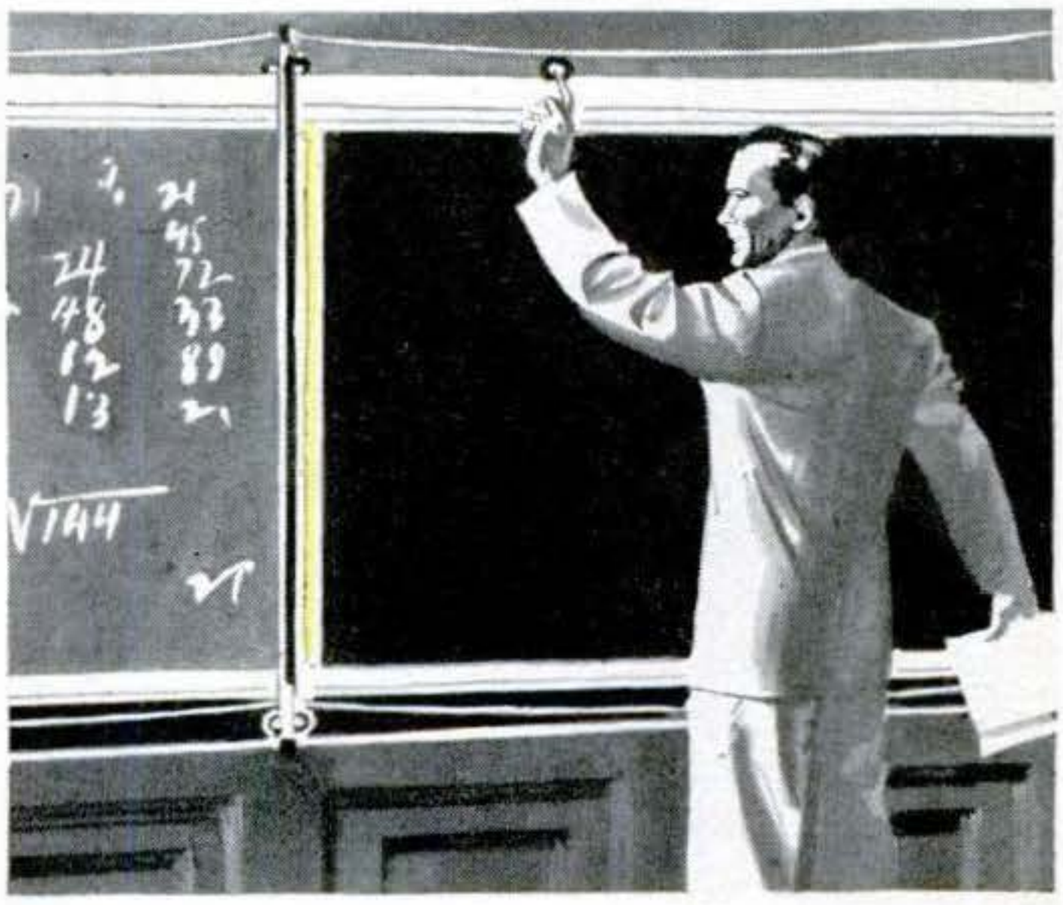
Everyone has his own pet idea of some gadget he would like to see in general use. What is YOURS? *Popular Science Monthly* will pay $5.00 for each one published. Use government postcards only. Contributions cannot be acknowledged or returned.



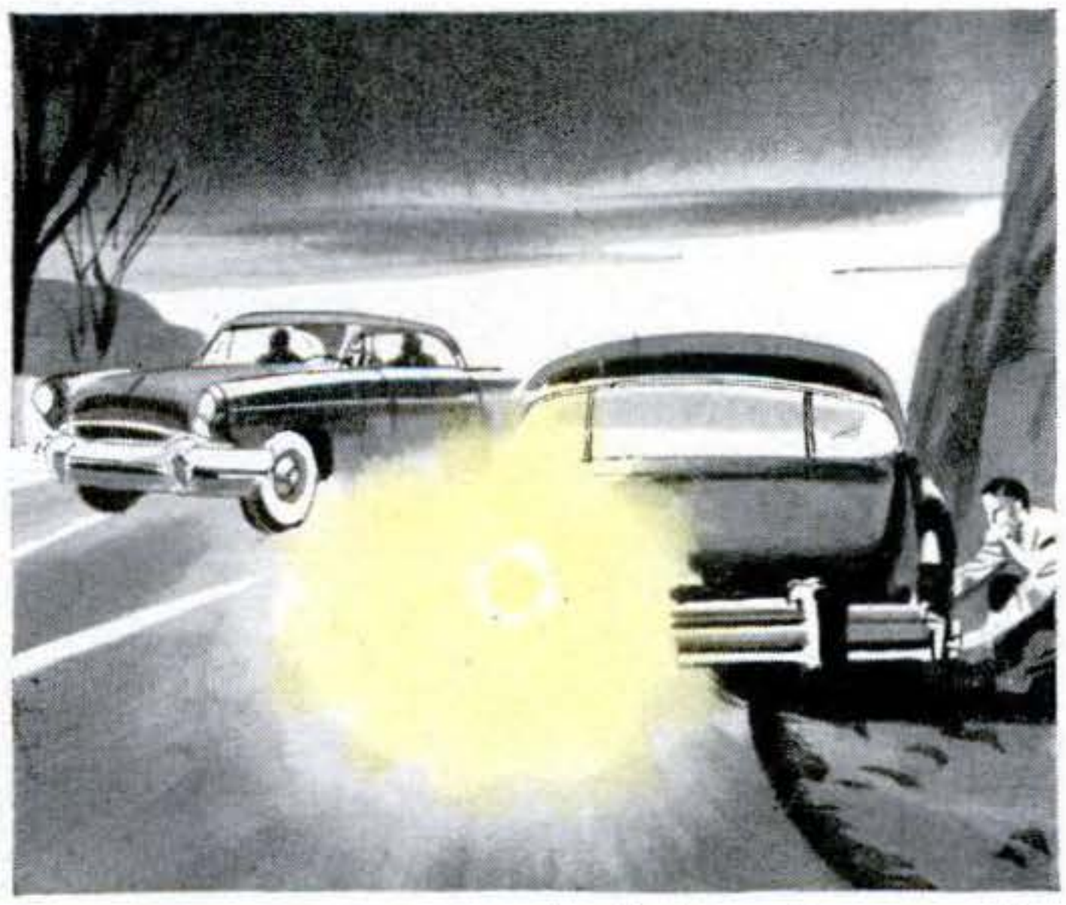
A TINY WRINGER to be attached to a bathroom wall for squeezing out the last bit of toothpaste, shaving cream or shampoo from the tube.—*M. Clark, New Castle, Pa.*



A WARNING BELL on a sewing machine that would ring just before the thread ran out, so you would not find you had been sewing with an empty bobbin.—*Brint Phillips, Los Angeles.*



AN ELECTRIC BLACKBOARD ERASER that would move back and forth across the entire board, cleaning it in a jiffy and saving time for teacher and students.—*Clark Fong, Fort Wayne, Ind.*



AN AUTOMATIC FLASHER built into the rear of a car. It could be turned on at the dash as a warning light when your car stalled on a busy highway at night.—*Jack Lloyd, Los Angeles.*

SMALL PLASTIC WINDOWS in the side of children's rubbers and galoshes so that you could insert the child's name for quick identification.—*Glenda Denton, Grand Haven, Mich.*

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This House Goes 50 M.P.H.

It looks like a bungalow, rolls like a car and is self-contained like a cabin cruiser.

AS SOON as the man leaning out the window of the shingled ranch house above gets his gas, he'll be nudging the speed limit down the highway. What's more, while the house is doing 50, Mother can be taking a late snooze in bed, Junior fixing himself a hamburger on the kitchen range, and Sister having a shower.

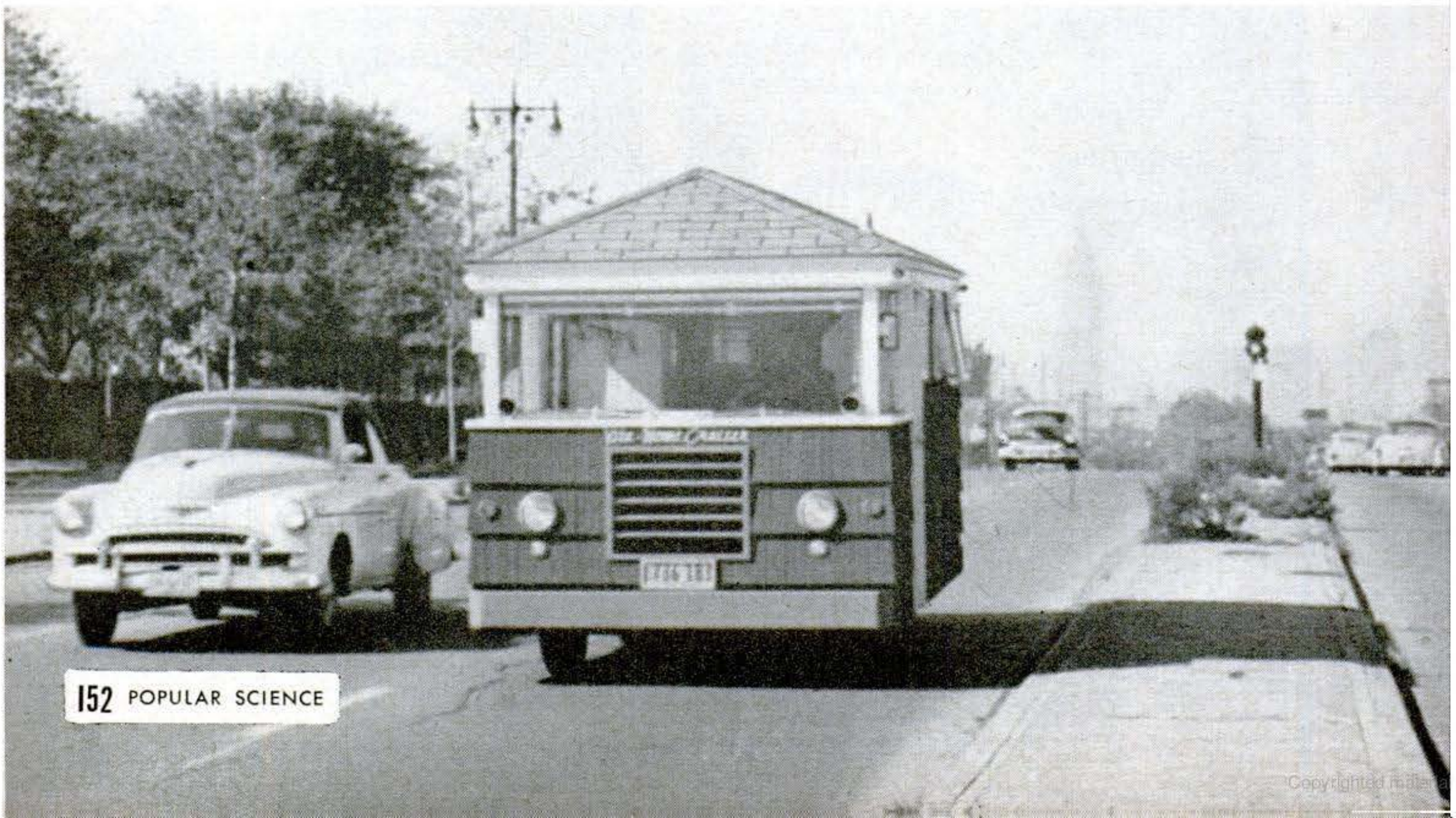
For this novel house on wheels—called the Vita Home-Cruiser—is not only highly mobile but completely self-contained. With your own water supply, light and heat, you can live in it in a wilderness or a city—and whether in motion or standing still.

The house is mounted on a heavy-duty Ford F5 truck chassis. The six-cylinder engine, in a floor compartment beside the driver, gets 11 to 15 miles to the gallon. Lights are powered by six-volt batteries, kept charged by an hour's idling a day.

The body is built of plywood over two-by-twos. The shingle siding, designer Lawrence Vita (PSM, Dec. '51, p. 150) points out, not only makes the cruiser more home-like but is a lot easier to repair than metal sheets or wood panels. Actually the cruiser evolved from a little house that Vita built on an old auto chassis as a mobile display of a new type of shingle. When people proved more interested in a house on wheels than in shingles, he designed a 4½-ton commercial model to sleep a family of five.

The Home-Cruiser costs $7,500, f.o.b. Huntington, N. Y. So far the biggest order has come from a California concern that plans to rent them to vacationers. In the meantime demonstration models get plenty of double takes—people even drive alongside and flag them down to ask questions. Once police came to investigate a Home-Cruiser when neighbors reported that someone had built a house overnight!

Manhattan's skyline in background, Home-Cruiser owner takes off for country—house and all.



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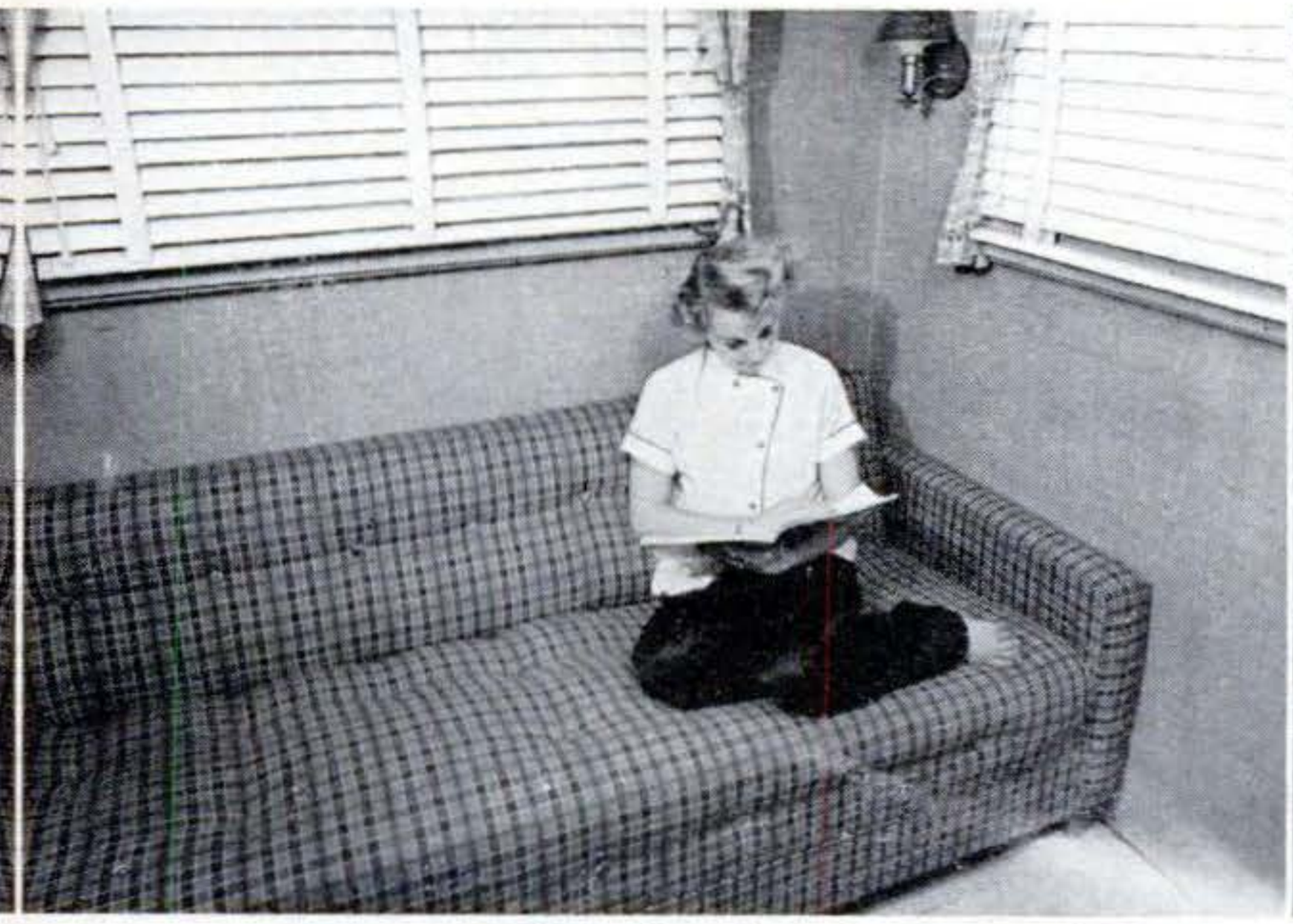
ON THE HIGHWAY, living-room picture window becomes the windshield. Passengers sit around table that can be combined with the two folding seats to make a double bed.



IN DAYTIME (left above) sofa in rear of Home-Cruiser is used for lounging. At night (right above) it's a double bed. Tiny bathroom with flush toilet and washbowl is waterproofed, doubles as shower stall. Water tank holds 80 gallons. Waste drains to septic tank.

KITCHEN SINK and stove of cruiser are right behind driver. Bottle gas fuels stove, refrigerator, water heater, but later models may be all-electric. Space heater burns oil.

HOME-CRUISER handles easily in traffic. Later models will have double wheels in rear. Cruiser is 21 feet long, nearly eight feet wide. Overall height is nine feet; ceiling, six feet three.

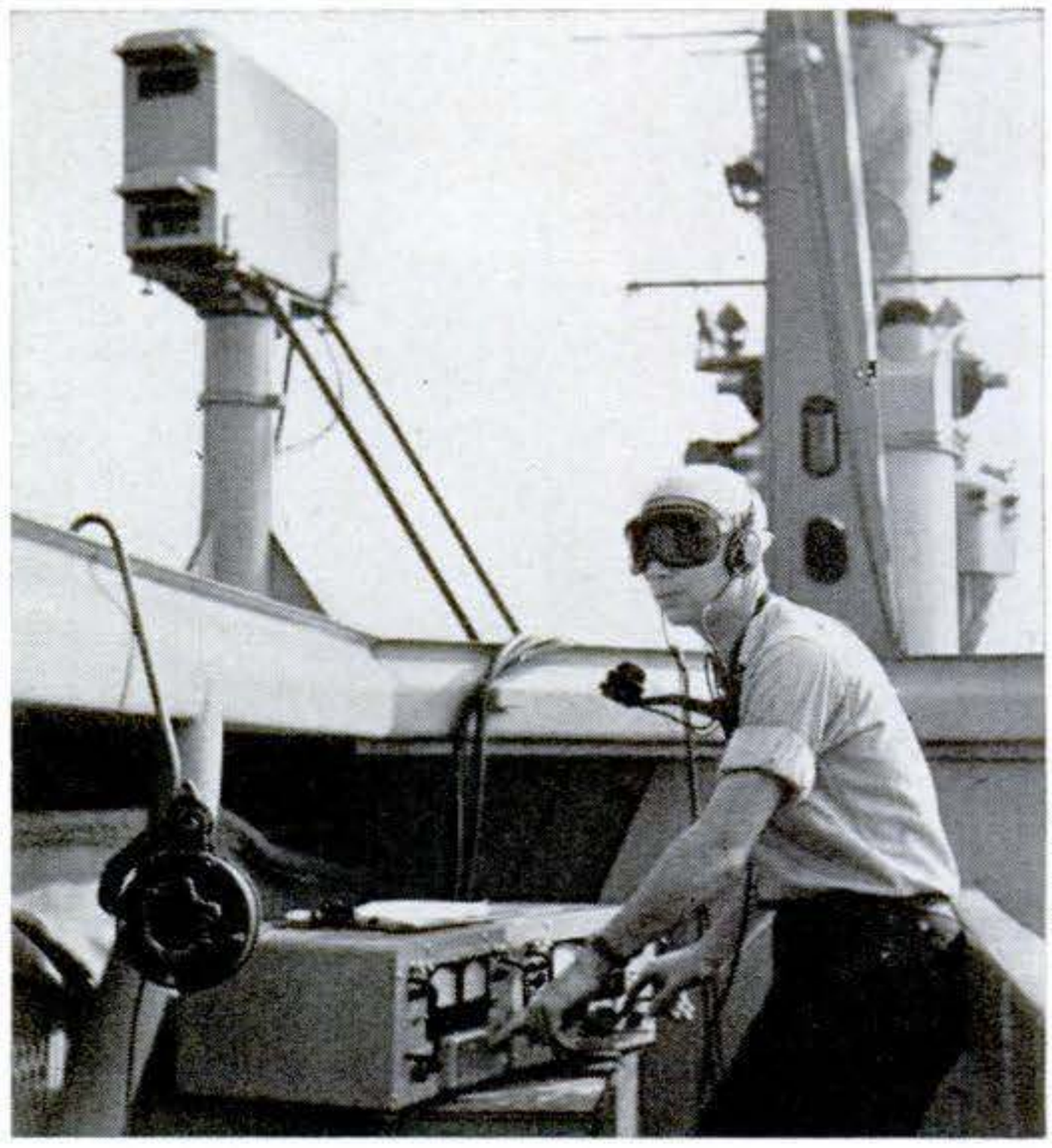
Three-Wheeler Eats Up the Miles on One Gallon of Gas

THIS British three-wheel car is said to cover 60 to 70 miles on a single gallon of gasoline and to attain a top speed of 40 miles an hour. The engine rides between the two wheels at the rear. About 10 feet long, 4½ feet wide and 4½ feet high, the car will seat two adults comfortably and provides plenty of room behind them for luggage or the weekly carton of groceries. It is the A. C. Petite, costs $1,114 in England.

75 years ago this month

Popular Science Monthly reported:

"MR. THOMAS BOND, assistant surgeon to Westminster Hospital, calls Urquhart, who introduced into England the Turkish bath, one of the benefactors of the age. This bath is, he says, stimulating and strengthening—a preventive as well as a curative in disease. Nor is this all: it promotes purity of mind and morals."



Machine Scores Pilots' Landings

TRODI—the touchdown-rate-of-descent indicator—tells jet pilots how fast they hit the deck of a carrier. An incoming plane intercepts light beams from a meter on a pedestal (left, above) and the computer has the answer when the pilot lands so that he can make corrections the next time around. North American Aviation devised the system to check new pilots and experimental planes.

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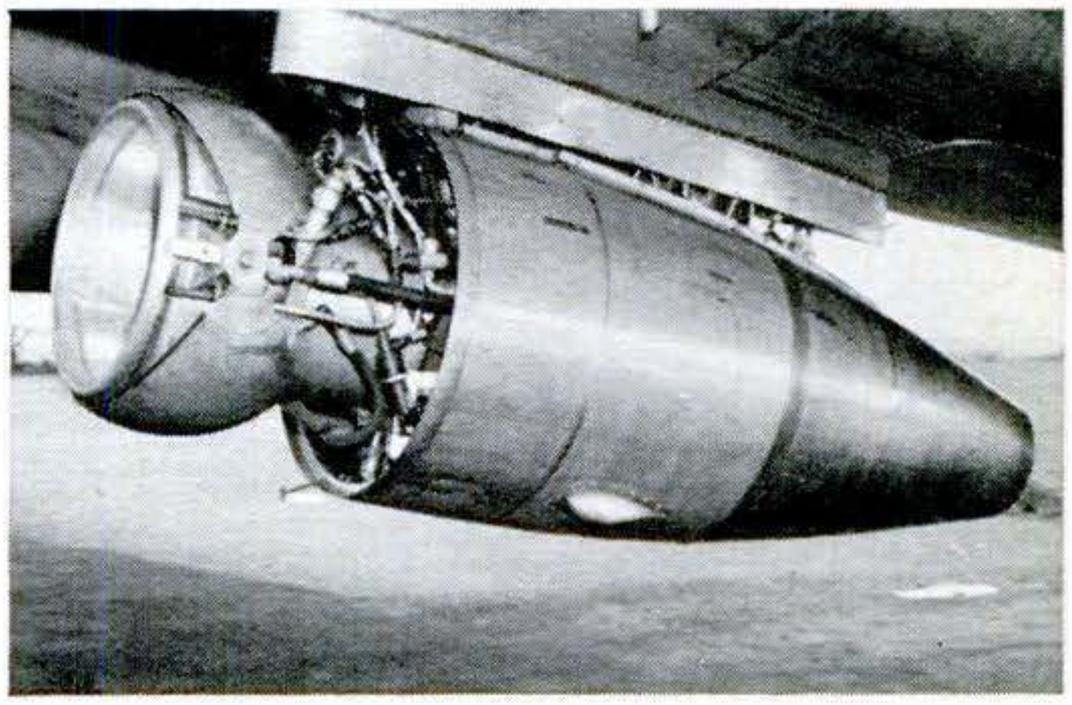
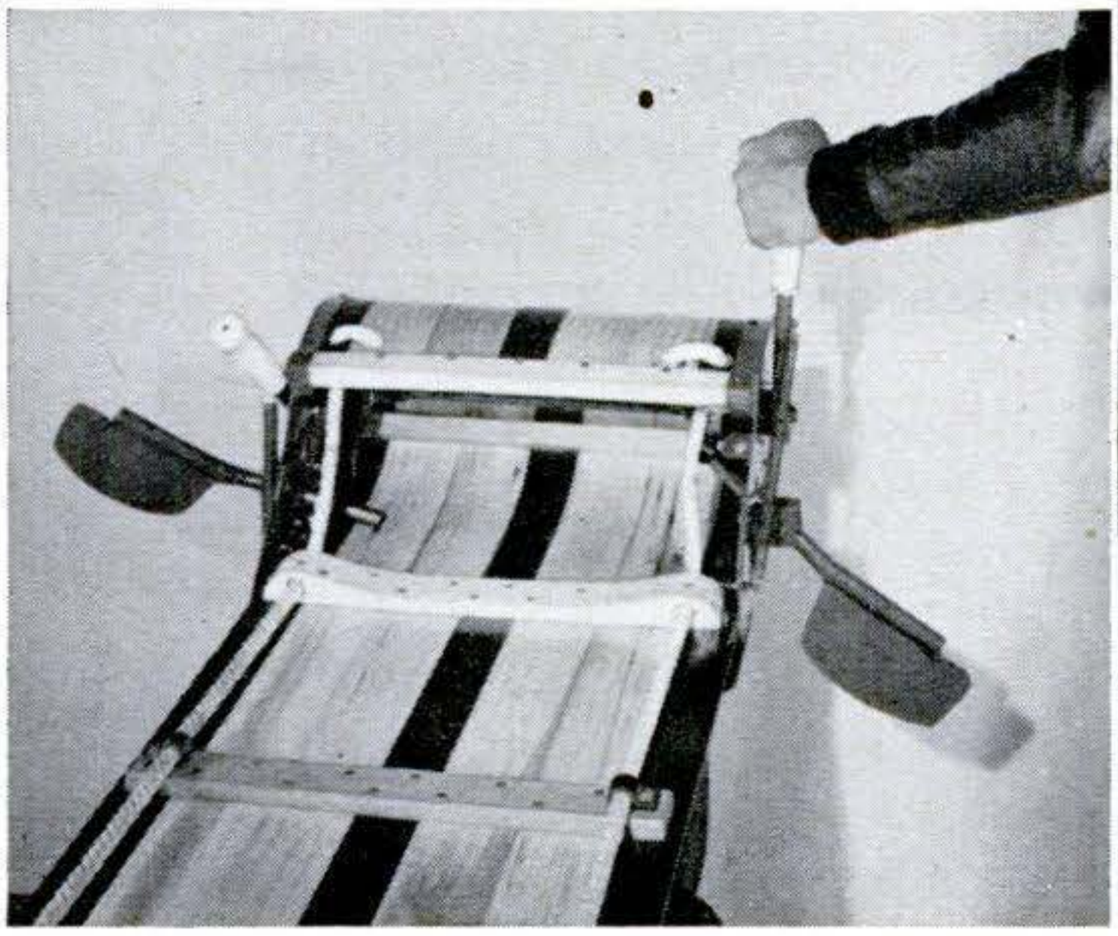
French Jet Gives Cargo Plane Power Boost for Take-Off

AIR freighters can carry heavier loads now, thanks to a small jet engine. Hung in a pod under the plane's belly, it is cut in to give a boost at take-off. And if an engine should conk out during flight, the little power package (right) lends a hand again. A French turbojet engine, the Marbore II was developed by the Societe Turbomeca. It is being used by the Flying Tiger Line.



Outrigger Paddles Brake Toboggan, Control Fast Turns

AFTER his family had a crack-up tobogganing, J. E. LaMarr of Torrance, Calif., devised the brakes shown below. A lever arm on either side of the toboggan pivots the braking fins to the side and downward, digging them into snow to a depth of 10 inches. This double action prevents a jarring stop that would unseat riders. Use of one brake makes steering easier. LaMarr is now marketing plans for constructing the brake.



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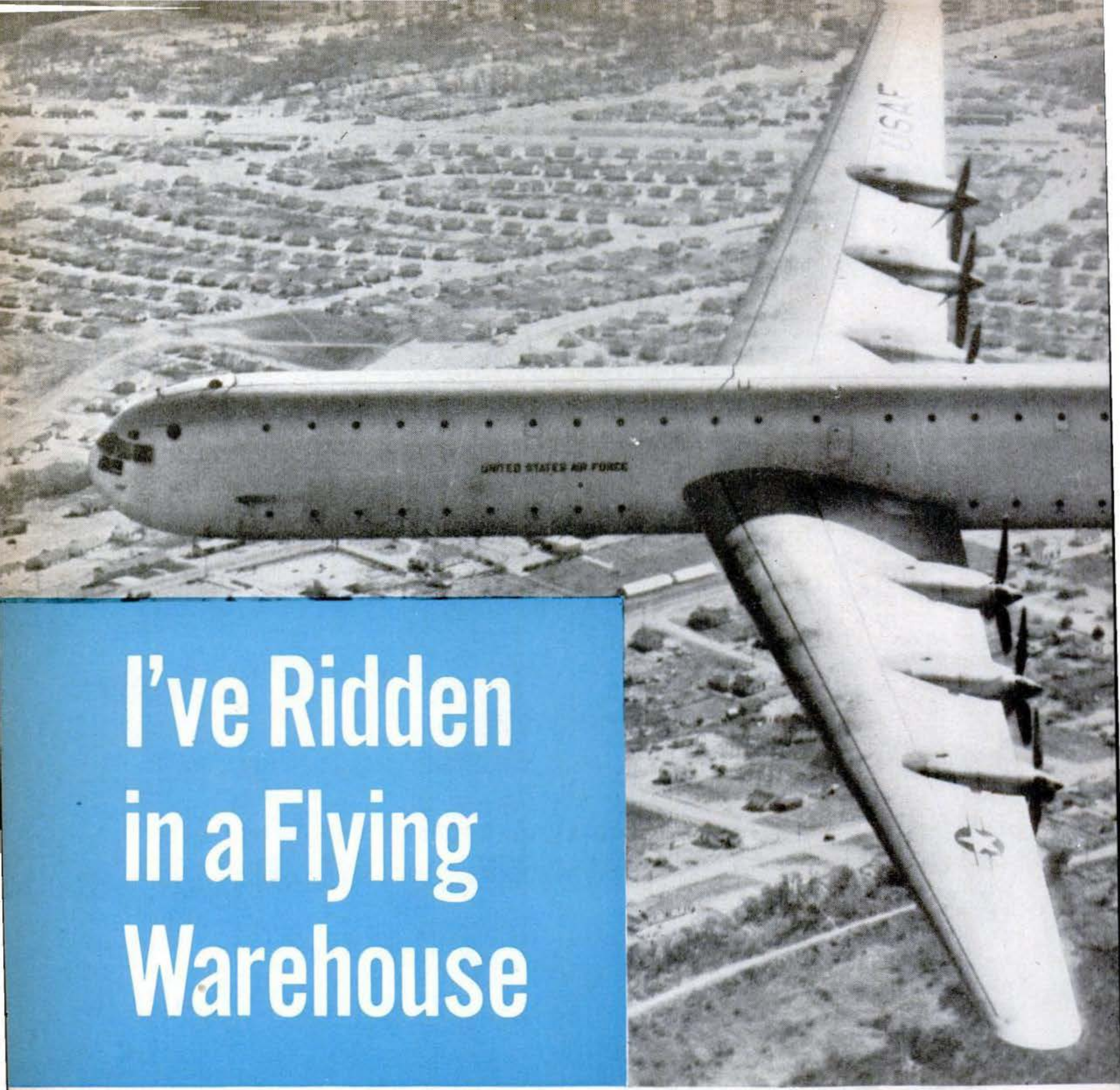

I've Ridden in a Flying Warehouse

Wrestling 41 tons of freight from San Antonio to Sacramento is a breakfast-to-lunch job for the world's largest cargo plane.

By Andrew R. Boone

LET'S hitch a ride—as I did recently—on the world's largest flying freight car: a warehouse on wings which has made more than 200 flights for a total of 1,650 hours, hauled more than 12 million pounds, and shattered a score of international records.

The plane is the Air Force's XC-99, a truck-horse version of the famous B-36 intercontinental bomber. Right now she's shuttling payloads between Kelly Air Force Base, San Antonio, and Sacramento, Calif., on a schedule that calls for two round trips a week.

Your first look at the huge plane isn't reassuring. Bathed in the blood red light of a Texas sunrise, XC-99 is a caricature of aerodynamic design. Poised on eight

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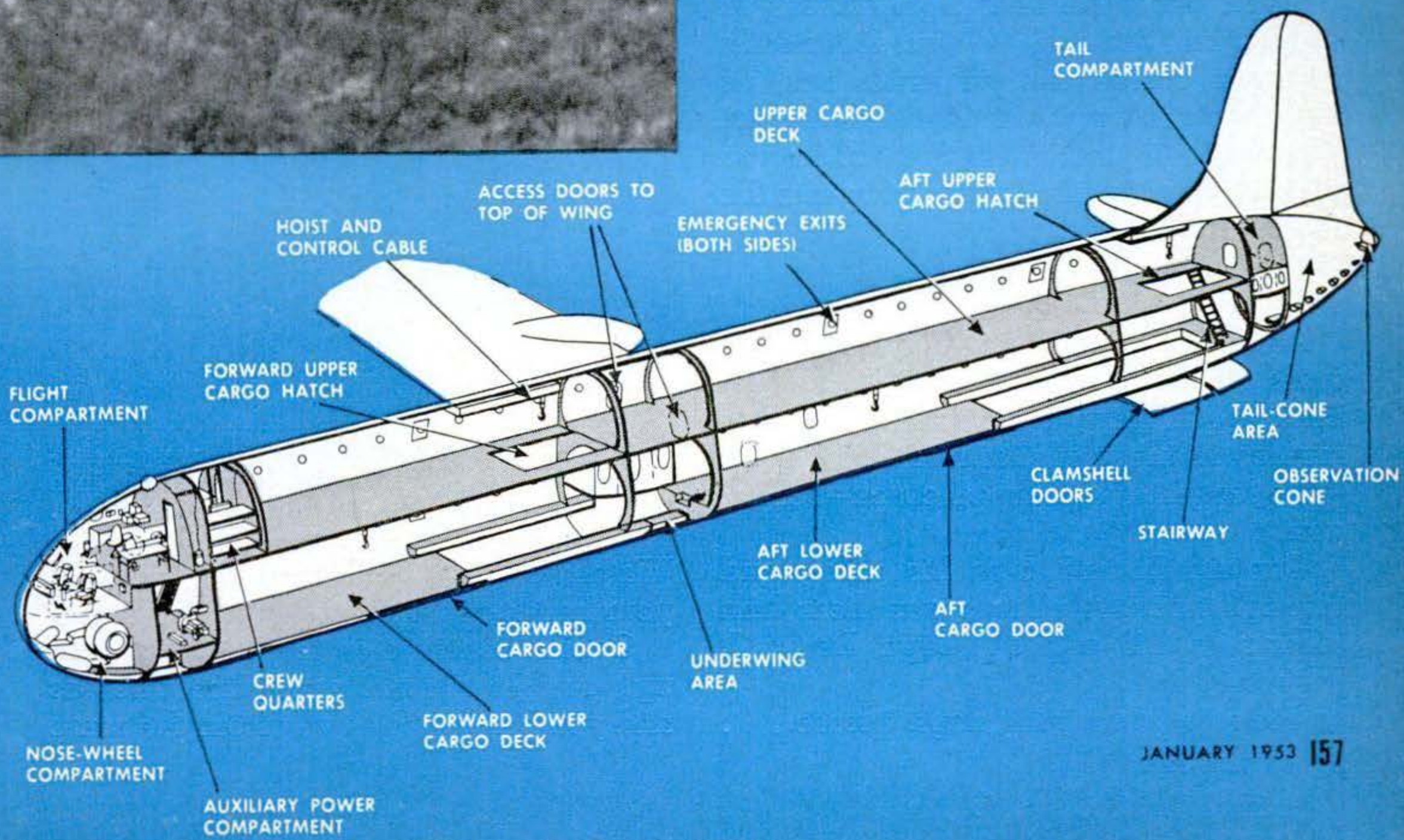
JONAH'S WHALE was a guppy compared to the XC-99. Above is shown its huge tail assembly that towers 57 feet 10 inches above the ground, 10 feet higher than its B-36 sister.



landing wheels straining under 147 tons of plane and cargo weight, her bloated fuselage seems far too large for the slender wing that splits her like a knife blade. The six 19-foot propellers strung along the trailing edge are reduced to the size of pinwheels by a 57-foot-high rudder assembly, and the whole ship looks as nose-heavy as a mallard with a goiter.

Fuselage Is Obstacle Course

You climb a ladder through the lower forward cargo hatch and find yourself on the first of the two huge decks. It is packed with war materiel—stuff that ranges all the way from airplane engines to garbage pails. Overhead are tracks for two of the four self-propelled hoists which are the muscles of XC-99's loading equipment. Each of them can lift and stow 10,000 pounds of freight at a clip.

You've been told that the fuselage volume of the flying freighter is equal to that of three average five-room homes. But home was never cluttered up like this. You edge your way past a part of the 82,146-pound cargo, climb through another hatch, and are in the crew's compartment. You park your helmet and oxygen mask, then open the narrow door that leads to the pilots' cabin.

Capt. James M. Pittard Jr. waves you to the jump seat behind him. It is nearly an hour before take-off time, but the flight crew is busy with countless checks. You want to get in on the act so you pick up your earphones and plug into the intercom.

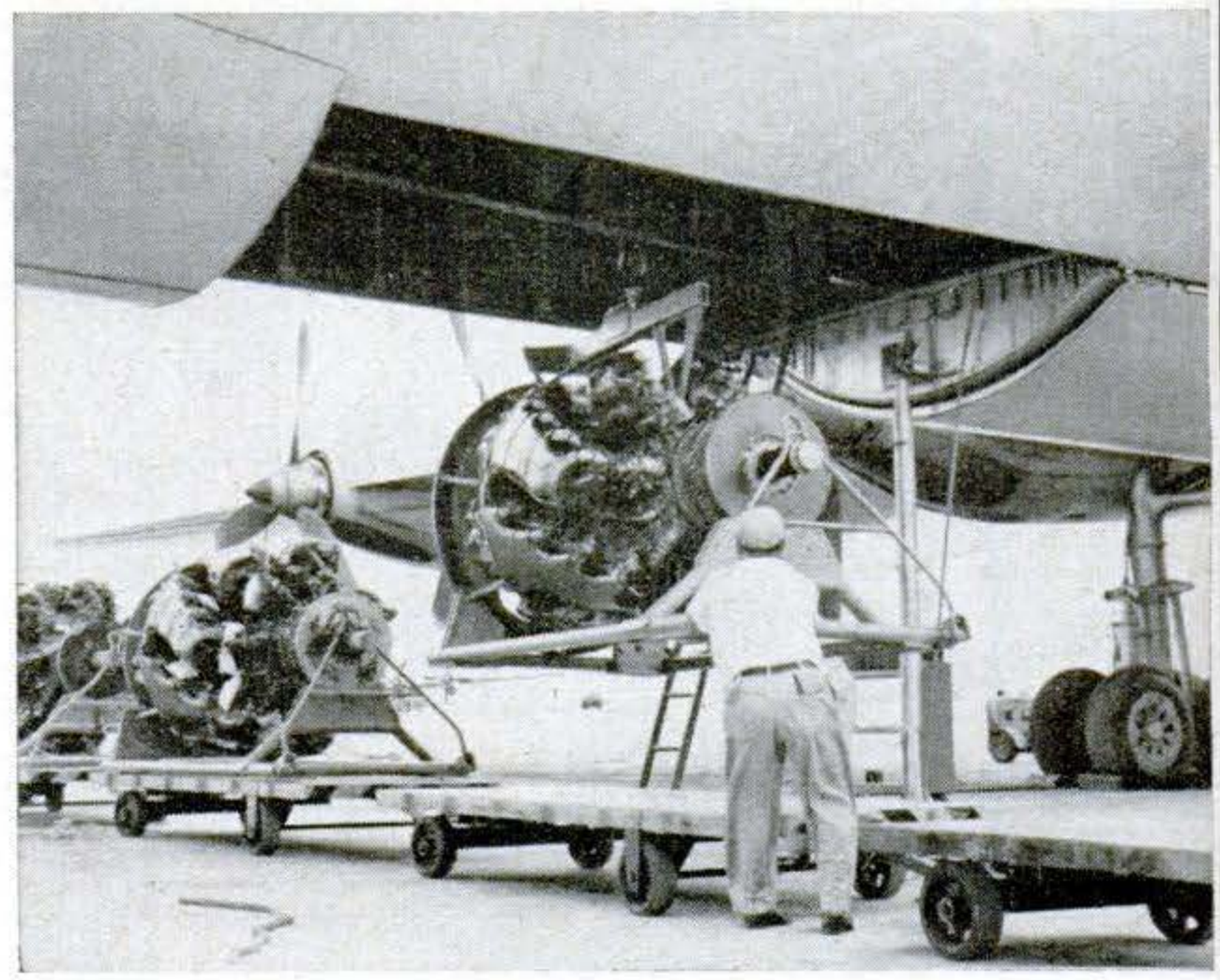
Pilot To Copilot

At 5:35 Captain Pittard orders the engines started. One by one, the six big Pratt & Whitneys take hold. Their roar is muffled as the propeller hubs are 85 feet —the length of a railroad coach—behind you.

Captain Pittard taps his mike, and through your earphones you hear him talking to his copilot, Capt. Leroy J. Johnson.

"Pick up your wing flaps, please . . .

DOUBLE DECKS have storage space equal to four boxcars. About 750 tons can be flown monthly on the San Antonio-Sacramento runs.



CARGO OF BOMBER ENGINES is no weight-lifting problem. Four special hoists built into the plane can handle 10,000 pounds apiece.

Watch your manifold pressures . . . Keep your hands on the throttles."

Checks continue as the engines warm up. At 6:15 Pittard bends the throttles and you pull slowly away from the ramp

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GARBAGE CAN and oxygen masks have nothing in common in the crew compartment. The pail is part of the cargo; masks are regular high-altitude equipment. Some of the freight handlers find breathing hard as the big ship outclimbs a sudden desert squall.

ASSIST from the autopilot is welcomed by PSM reporter Andrew Boone, who took over the controls 7,000 feet above New Mexico.

TO DISTRIBUTE WEIGHT, twin main landing gear have four small wheels each. Original single main wheels broke through some runways.

and onto runway 15. There's a 7,300-foot ribbon stretching away to the southwest in front of you, and another 300 feet to the rear. With her payload, XC-99 may need all the runway she can get.

"We'll take another 20 blocks," Pittard says. "Scanners, count 'em."

From their posts far aft on the lower deck, two sergeants look back through

[Continued on page 280]

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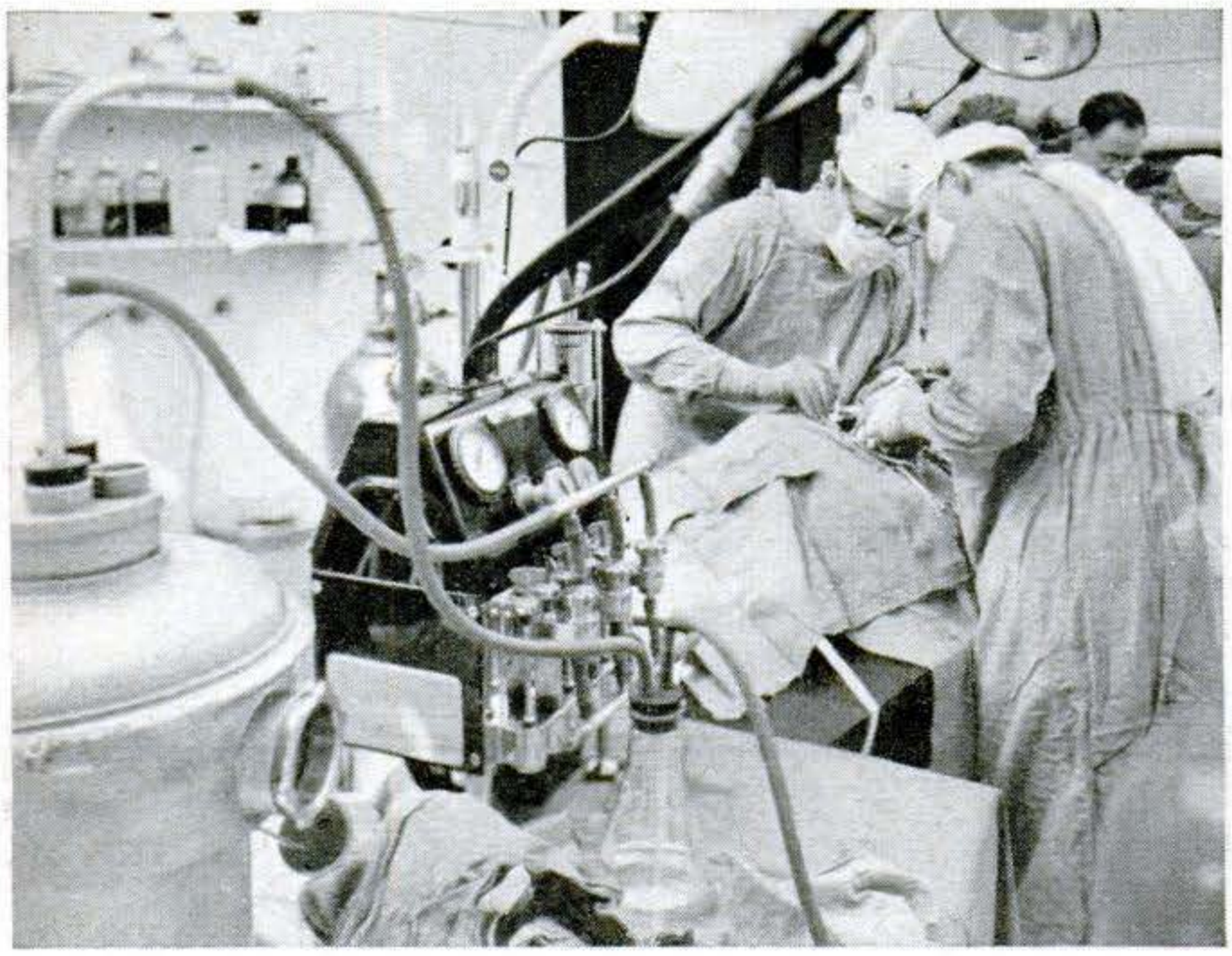
Pump Does Human Heart's Work While Doctors Operate on It



A NEW mechanical heart recently took over the job of circulating a patient's blood for 50 minutes while his heart was operated on at Detroit's Harper Hospital (PSM, Dec. '52, p. 153).

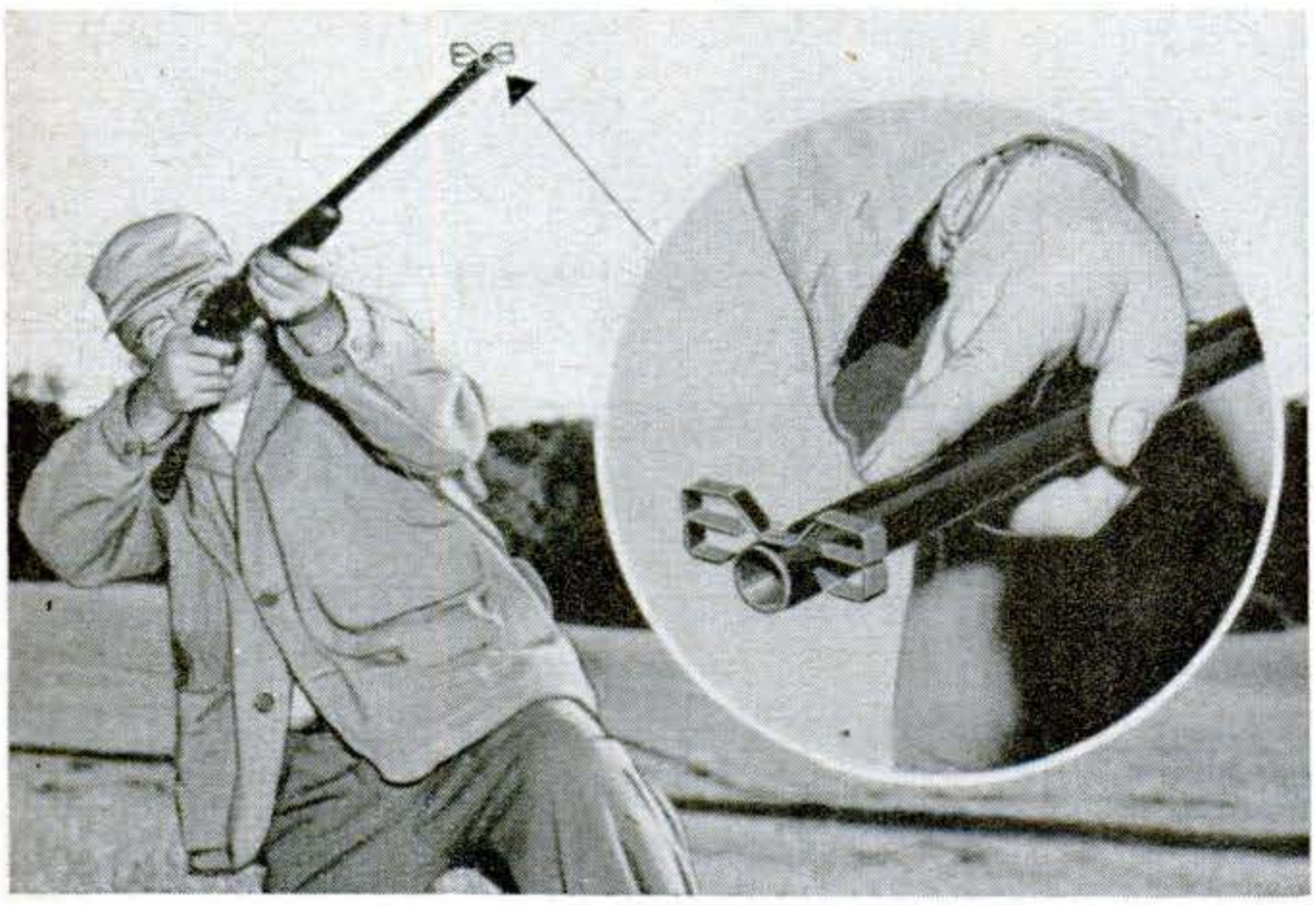
The pumping mechanism empties the heart of blood so that a surgeon can see the interior of the heart instead of depending on his sense of touch. Still in the experimental stage, the heart machine was built by a team of medical and engineering researchers from the General Motors Research Laboratories and the Michigan Heart Association.

Briefcase Dictating Machine Is Book Size, Weighs 12 Pounds

THIS bantam dictating machine, said to be the lightest ever made, weighs only 12 pounds. Slimmed down to less than 2½ inches, it can be slipped into a briefcase, and with a converter added, can be set to work in a car or plane. Regulation disks hold 30 minutes of dictation.

The microphone doubles for transcribing and a single knob controls the playback. The new VP Voicewriter is manufactured by Edison of West Orange, N. J.

Offset Sight on Gun Barrel Gives Correct Lead on Moving Target



AIMING a gun with the correct lead should be easier with this sight. It is offset on the barrel so that when the eye frames game in the sight area, the gun points ahead of the target. As long as the target is visible above the sight bar, the angle of lead is said to remain reasonably constant, regardless of the target distance.

Models that clip on rifles and single- or double-barrel shotguns are available. The Leed Sight Co., Navarre, Minn., makes the device.

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CHEST-HIGH, the Pegaso 102 clears the road by a bare six inches. Twin outside exhaust pipes run just beneath the doors. One is visible at left below. Car is 13 feet four inches long.

Spanish Sports Car Hits 170 M.P.H.

This 'Flying Horse' with a choice of engines is reported to be as stable as it is fast.

ONE of the world's fastest sports cars is a newcomer from Spain, the Pegaso 102, named for the legendary flying horse, Pegasus. Its speediest model is credited with a top pace of 170 miles an hour, at the same time holding the road "like a train on a track."

Harold Radford, a British driver, told me he had guided a Pegaso down a wet, winding highway at 120 miles an hour without skidding, shifting into lower gears when he needed to slow down the car and using his engine for braking.

The Pegaso is powered by a compact

BROAD OF BEAM, Pegaso affords ample back view through one-piece transparent canopy. Rear end encloses spare tire and 39-gallon fuel tank.

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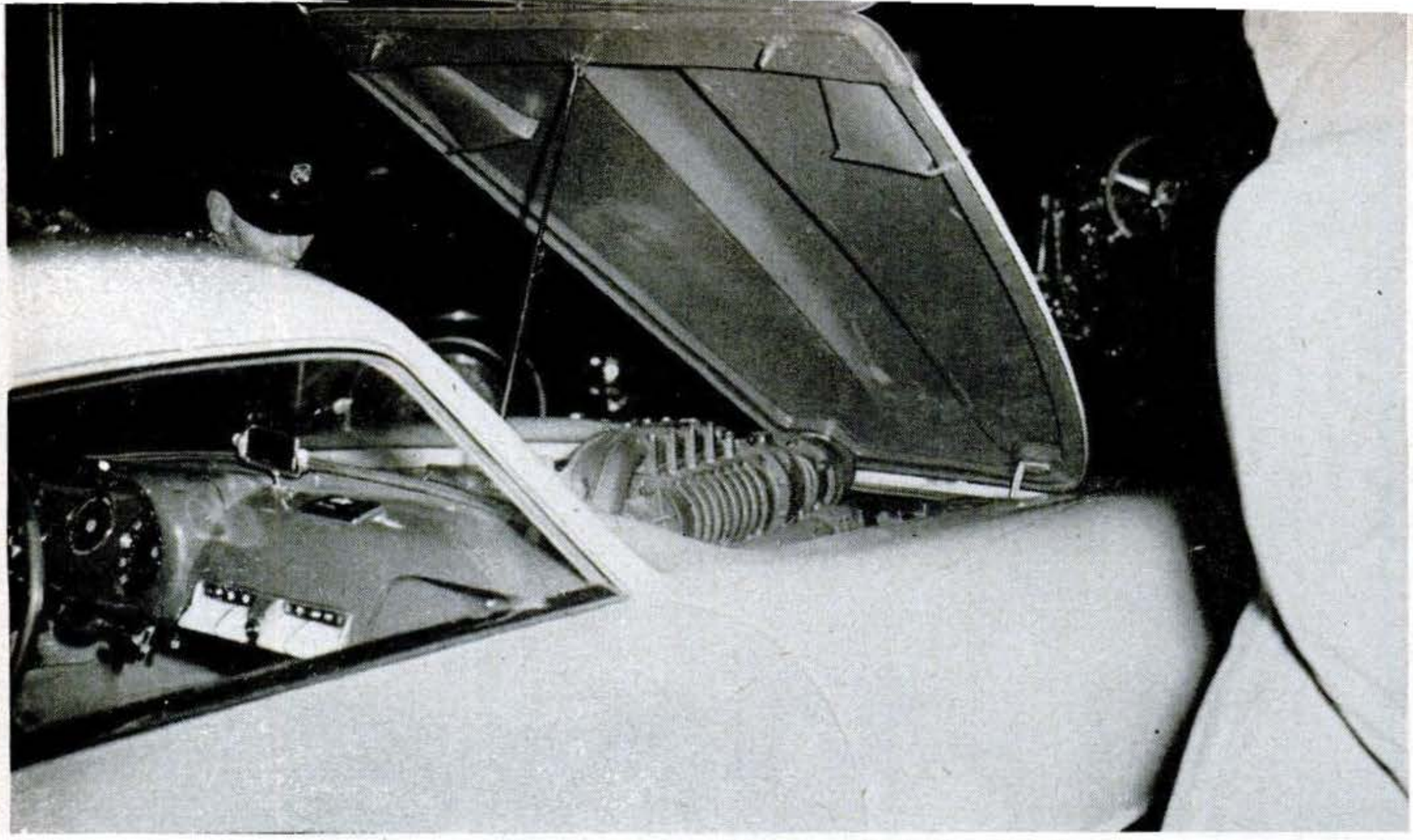
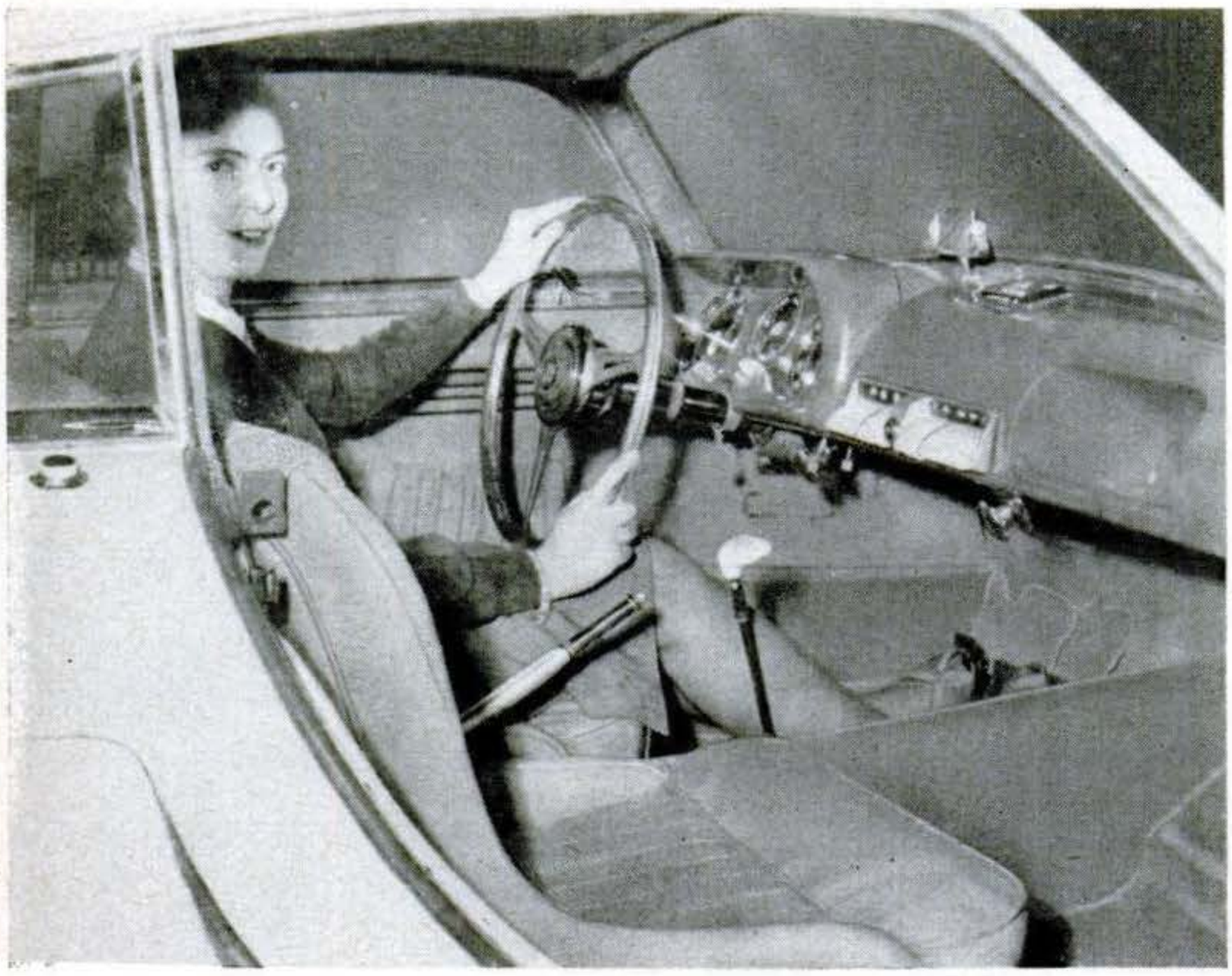


FRONT-HINGED HOOD, in open position, reveals the top of a two-stage supercharger, which has enabled the 165-hp. engine to push the car up to 160 miles an hour in time trials.

V-8 engine with twin overhead camshafts and very short piston strokes. The engine comes in two sizes—a 152.5-cu.-in. piston displacement for a one-ton car, and a larger 170.8-cu.-in. displacement for a ton-and-a-half model. Both sizes are souped up on demand, but they perform impressively without it. Cars using the smaller engine, without supercharger, have been clocked at 120 miles an hour in tests in Spain.

The Pegaso 102's hard-top two-seater, a cream-colored dazzler with a broad red strip running from its nose straight over the top to the rear end, made a great stir at the 1952 motor shows in London and Paris. At that time there were hardly three dozen Pegasos in the world. They are made in Barcelona by Empresa Nacional de Autocamiones, S.A., a government-subsidized private company.—*William McGaffin.*



PUT YOURSELF in the driver's seat. That will cost you $8,000, plus ocean freight from Barcelona and U.S. duty. Next problem: Find a highway where you can cruise at 160 m.p.h. Accelerator (not shown) is as large as brake pedal.

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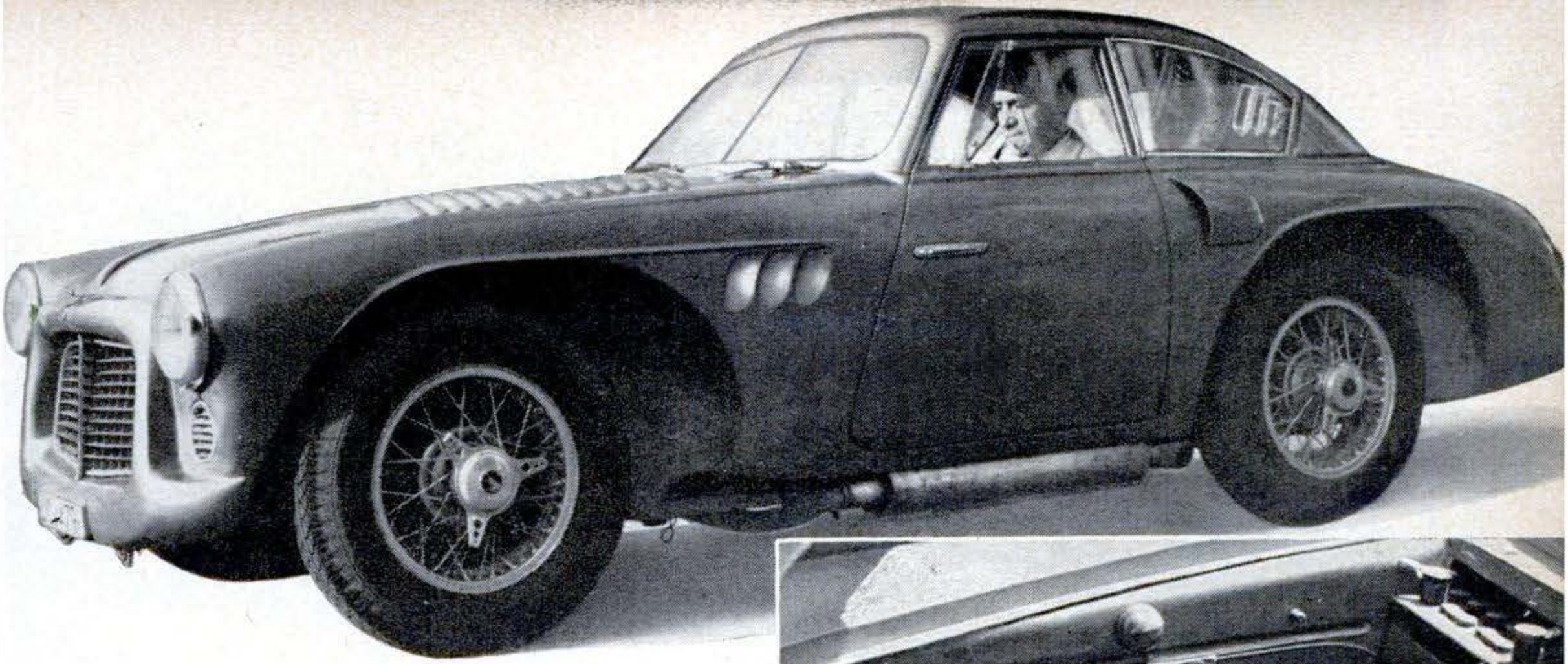
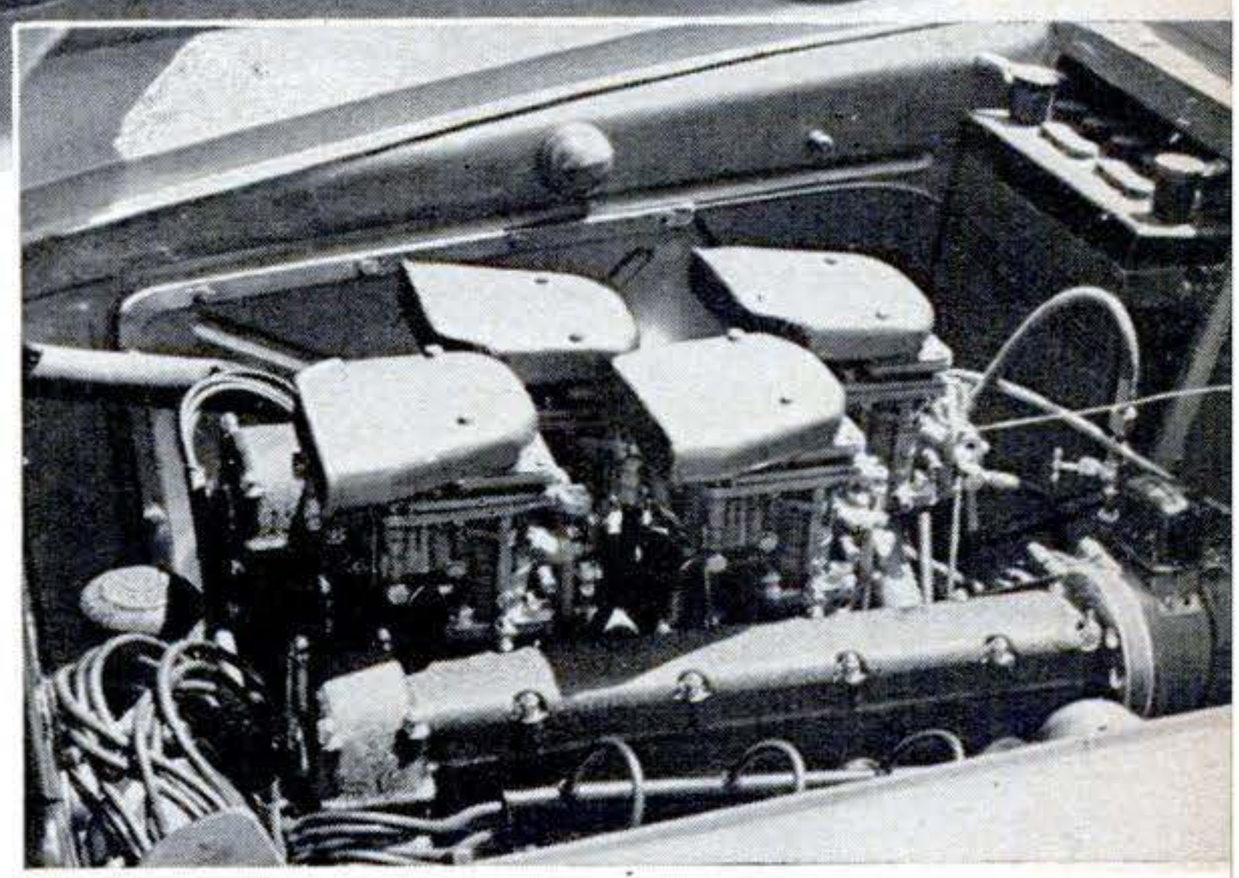
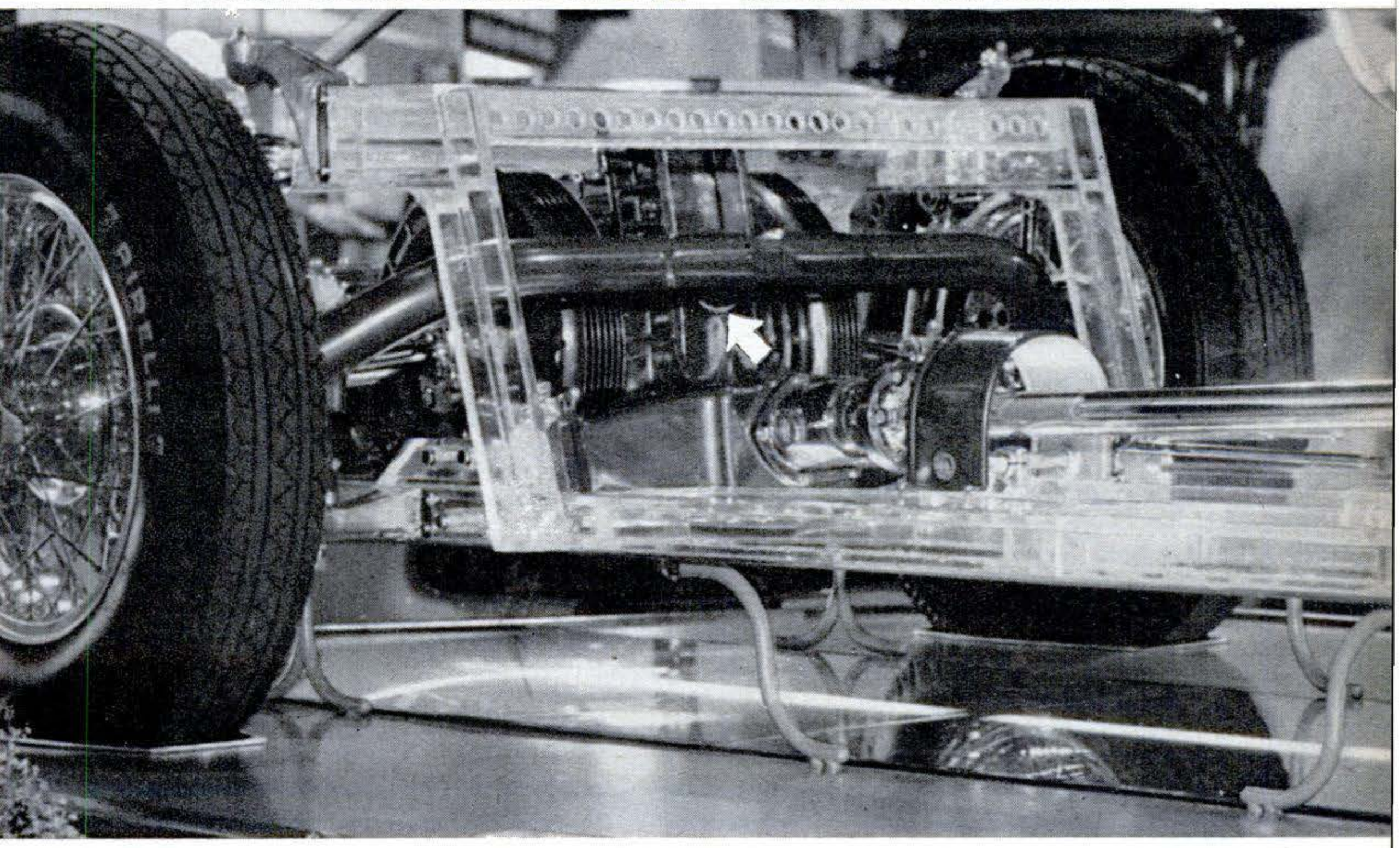




PLENTY OF HOOD for plenty of horsepower. The 2.8-litre model above was used to whet interest in London, where buyers would have to shell out $22,120 for a Pegaso 102. This model, which has no supercharger, gets its zip from four carburetors (right), mounted two on each side of the V-8, twin-overhead-camshaft engine.

SECRET of the ease with which the car holds the road is the tubular arch seen behind the transparent frame mockup below. Bolted to the axle, it is centered on a guide wheel (arrow) that slides up and down in a vertical channel. This allows spring play but limits sidesway by keeping the wheels always at a fixed distance from the frame.



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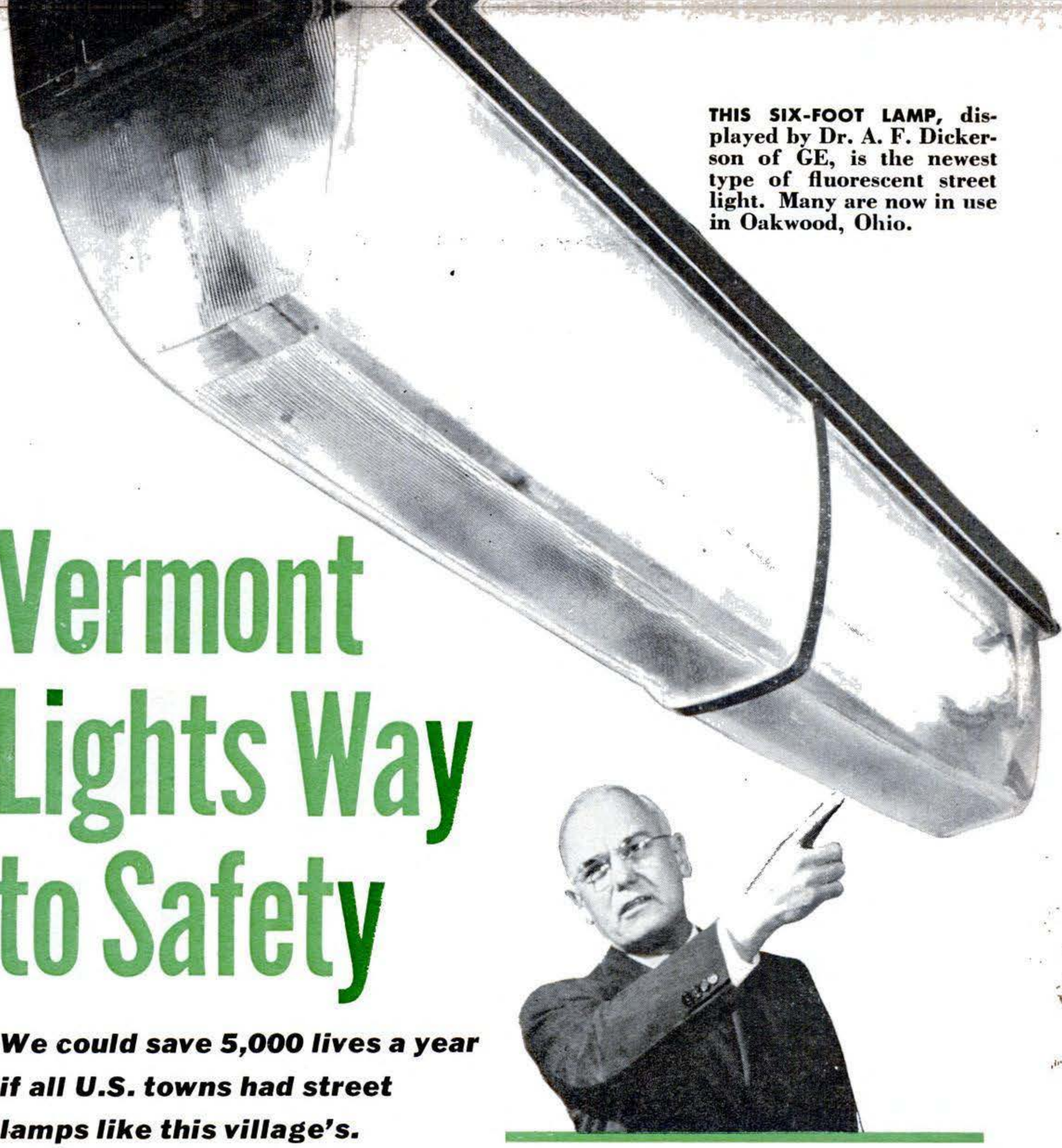

THIS SIX-FOOT LAMP, displayed by Dr. A. F. Dickerson of GE, is the newest type of fluorescent street light. Many are now in use in Oakwood, Ohio.

Vermont Lights Way to Safety

We could save 5,000 lives a year if all U.S. towns had street lamps like this village's.

By Wesley S. Griswold

AFTER dark, people often drive miles to stare at the business section of Lyndonville, Vermont, a little town tucked away in snowy hills 39 miles south of Canada. That's because it has the most advanced kind of street lighting in the country—king-size fluorescent tubes that spread a cool, white, glareless glow so evenly over the thoroughfare and its sidewalks that you can easily read by it at any point along the street. The winter-night scene on the opposite page is dramatic evidence of this.

If all U. S. towns and cities had street lights as effective as these, we could prevent 5,000 to 10,000 traffic deaths a year, says Dr. A. F. Dickerson, General Electric's expert on street lighting.

Good street illumination makes a striking difference in accident rates. Kansas City has proved it.

In the average poorly lighted city there are four nighttime accidents for every one in the daytime. In 1945, in Kansas City, the ratio was nine to one. Kansas City then began to modernize its street lighting. By the end of 1951, with no more than three-quarters of the job done, the nighttime accident rate in that city had dropped until it was almost even

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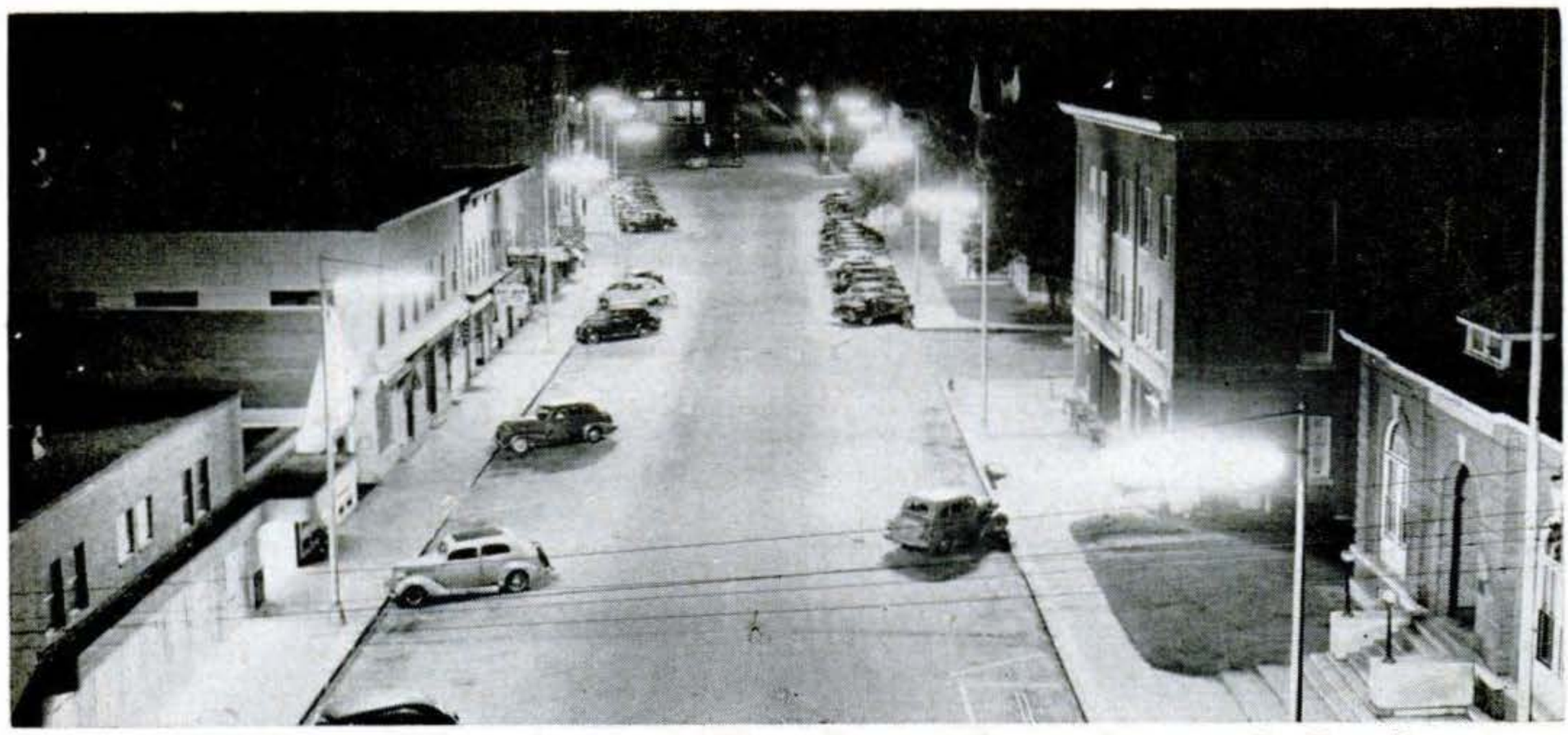
THE OLD LIGHTS on Lyndonville's main street were clusters of incandescents on low poles in midstreet. They provided "glaring globs of light with darkness in between."



THE NEW LIGHTS, installed in August, 1951, illuminate the center of Lyndonville like a show window and so evenly that there is no noticeable variation in intensity.

with the daytime rate. And after Cleveland had brought its street lighting up to date, its crime rate dropped a whopping 50 percent.

Incandescent lights, Dr. Dickerson says, are fine for residential districts, where less extensive illumination is required. Mercury-vapor lamps are excellent for flooding a relatively small area, such as a busy intersection, with brilliant light. But he would like to see fluorescents used to illuminate all main business streets and urban traffic arteries. Their light is soft, easy on the eyes and covers a large area.

American lighting engineers agree that, for the amount of illumination per watt, fluorescent lights are the most efficient. British experts claim that better illumination is obtained with 240 watts of fluorescent lighting than with 400 watts of mercury-vapor lighting or 750 watts of incandescent light.

An incandescent lamp lights when current passing through its tungsten filament causes the filament to become white-hot. A lot of heat is not converted into light and is wasted.

A mercury-vapor lamp lights when an electric arc passes through its high-pressure vapor, which glows as it is excited by the arc's stream of electrons. This produces more illumination per watt than an incandescent light, but a comparatively large amount of energy is wasted in the form of heat.

A fluorescent lamp is a lot like a mercury-vapor lamp, except that the va-

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por it contains is under low pressure. When an arc's electrons pass through this vapor, the energy given off is largely invisible. That is, it *would* be invisible if the tube of the lamp were not coated with phosphor. Phosphor makes invisible energy visible.

A fluorescent light is the coolest of the three principal types, converting its energy into illumination with the least waste. Lyndonville's fluorescents provide nearly three times as much light as the incandescents that they replaced—*and on the same amount of current.*

Lyndonville was the first community in New England and the second in the U. S. to install fluorescent street lights. Detroit had them in one portion of an outlying business district shortly before Lyndonville was ready. Oakwood, Ohio, a suburb of Dayton, just recently switched on the largest main-street installation of fluorescents in the country.

Bright as a Five-and-Dime

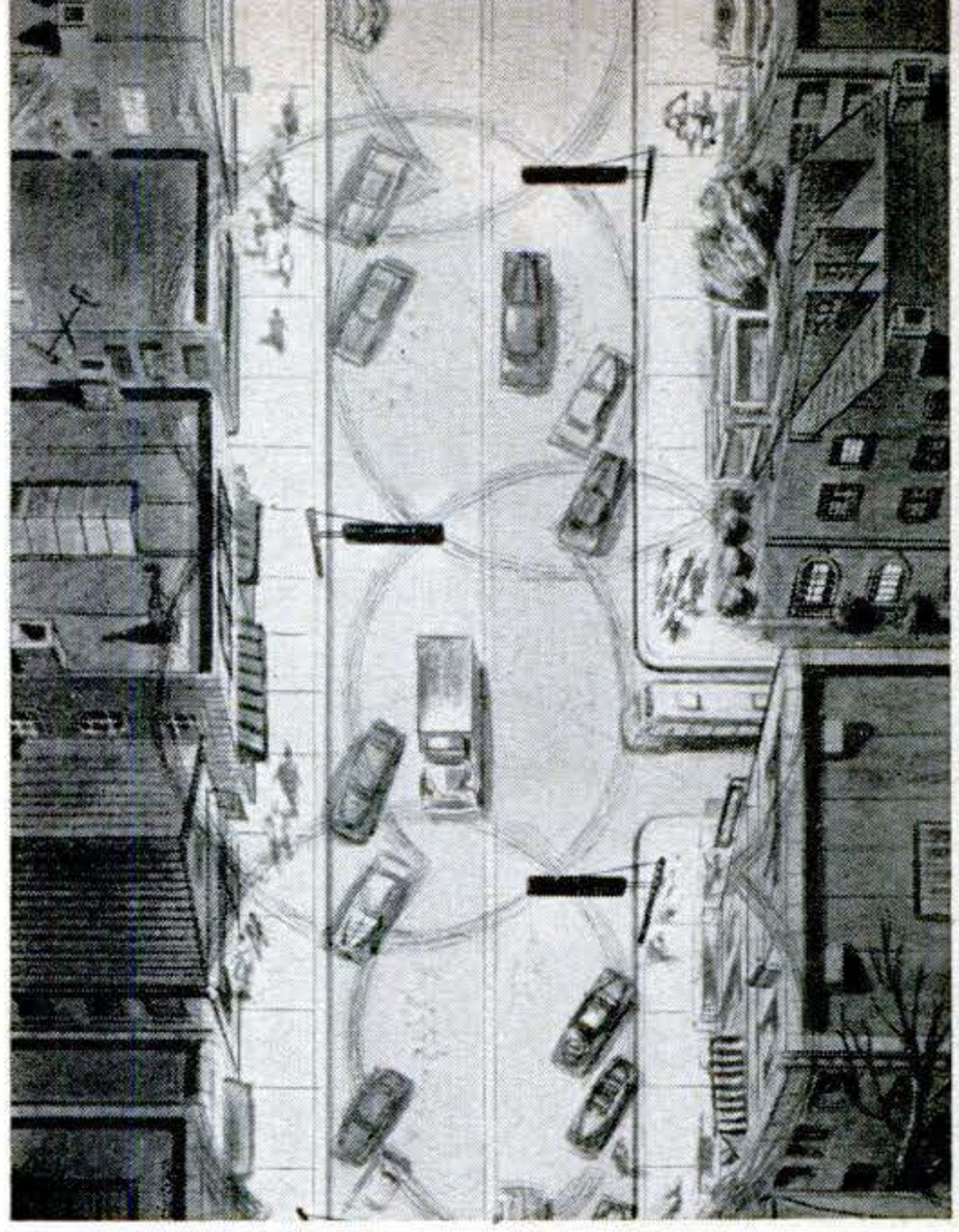
Lyndonville's new lights, which, one long-time resident and storekeeper said, "make Depot Street as bright as the inside of the five-and-ten," are 28 feet above the pavement. They are eight feet long and stretch out at right angles to the street on the arms of 30-foot aluminum poles.

Each fixture contains two pairs of eight-foot bulbs. Behind each pair is a highly polished reflector, and the reflectors are mounted back to back. The lights, which have a life of about two years, shine out through clear-plastic windows.

No Dark Patches

The great length of these bulbs is one of the chief reasons for their excellence as street lights. The source of light is so wide that the paths of illumination from lamps on opposite sides of the street, even though they are directed up and down the street rather than across it, largely overlap. (The diagram on this page shows how.)

There are no dark patches anywhere on pavement or sidewalk. Pedestrians and cars are perfectly silhouetted against soft white light that is easy on the eyes of approaching drivers. This is an important safety factor.



SECRET OF SUCCESS in spilling light over Lyndonville's main street lies in the way the figure-8 patterns of illumination from the staggered fluorescent fixtures overlap.

Fluorescent fixtures for street lighting cost about twice as much as other types. But their efficiency apparently makes up for the high initial cost.

"Over a period of 10 years," Lee Gray, manager of Lyndonville's electric-light plant, declared, "I figure our savings in current and bulb replacement will completely offset the higher cost of the light fixtures."

Lyndonville merchants whose stores line Depot Street are unanimous in their praise of the fluorescent street lights. Some claim the lights have increased their business.

The only dissenting voice I heard was that of a tired old carpenter who was leaning against a store window while he waited for a bus to arrive through the falling snow.

"It's all right to have Depot Street as bright as day," he said without enthusiasm as he glanced up at the fluorescent light above him, "but the trouble is it makes the side streets we live on seem as dark as back alleys." END

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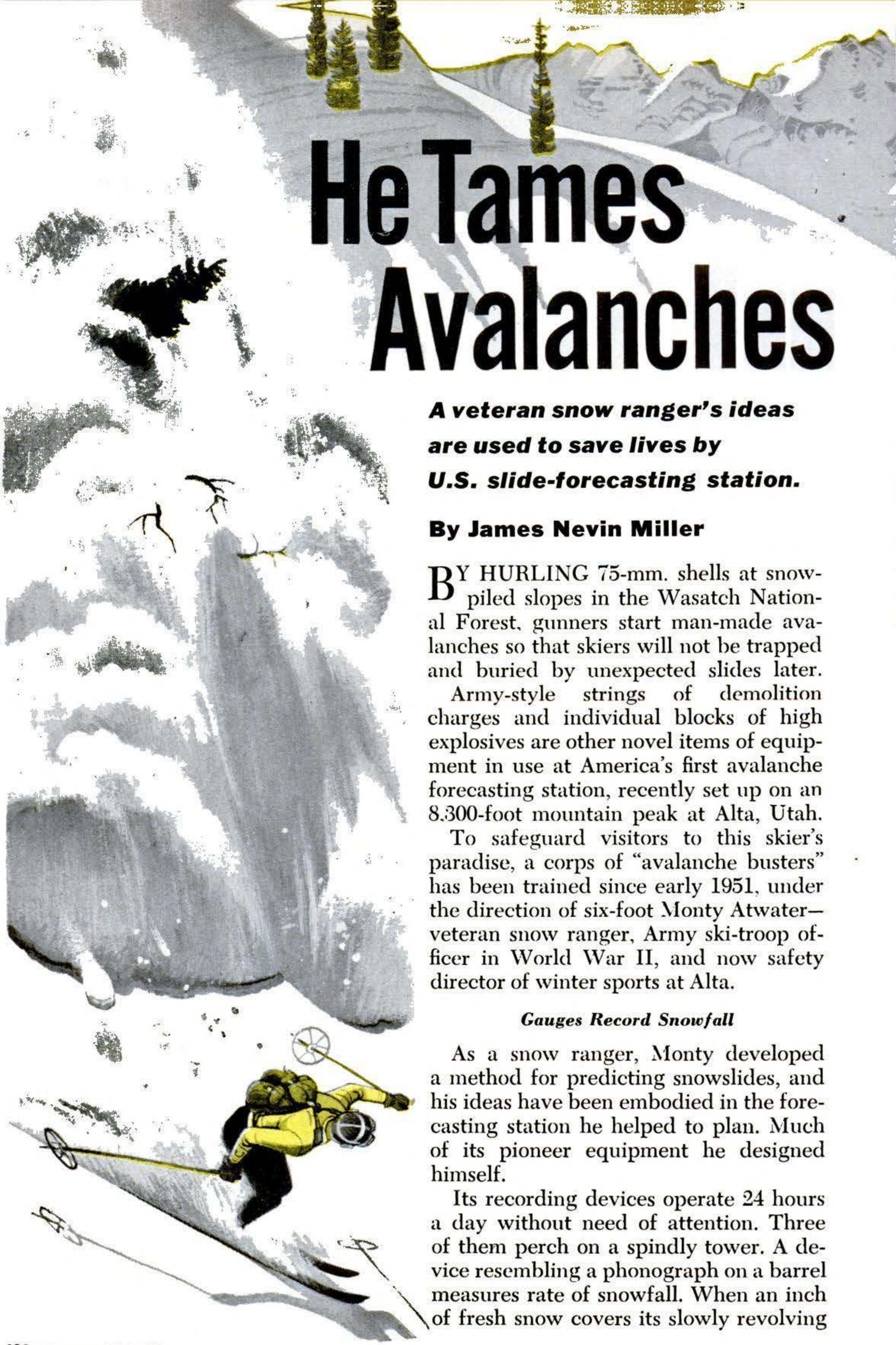

He Tames Avalanches

A veteran snow ranger's ideas are used to save lives by U.S. slide-forecasting station.

By James Nevin Miller

BY HURLING 75-mm. shells at snow-piled slopes in the Wasatch National Forest, gunners start man-made avalanches so that skiers will not be trapped and buried by unexpected slides later.

Army-style strings of demolition charges and individual blocks of high explosives are other novel items of equipment in use at America's first avalanche forecasting station, recently set up on an 8,300-foot mountain peak at Alta, Utah.

To safeguard visitors to this skier's paradise, a corps of "avalanche busters" has been trained since early 1951, under the direction of six-foot Monty Atwater—veteran snow ranger, Army ski-troop officer in World War II, and now safety director of winter sports at Alta.

Gauges Record Snowfall

As a snow ranger, Monty developed a method for predicting snowslides, and his ideas have been embodied in the forecasting station he helped to plan. Much of its pioneer equipment he designed himself.

Its recording devices operate 24 hours a day without need of attention. Three of them perch on a spindly tower. A device resembling a phonograph on a barrel measures rate of snowfall. When an inch of fresh snow covers its slowly revolving

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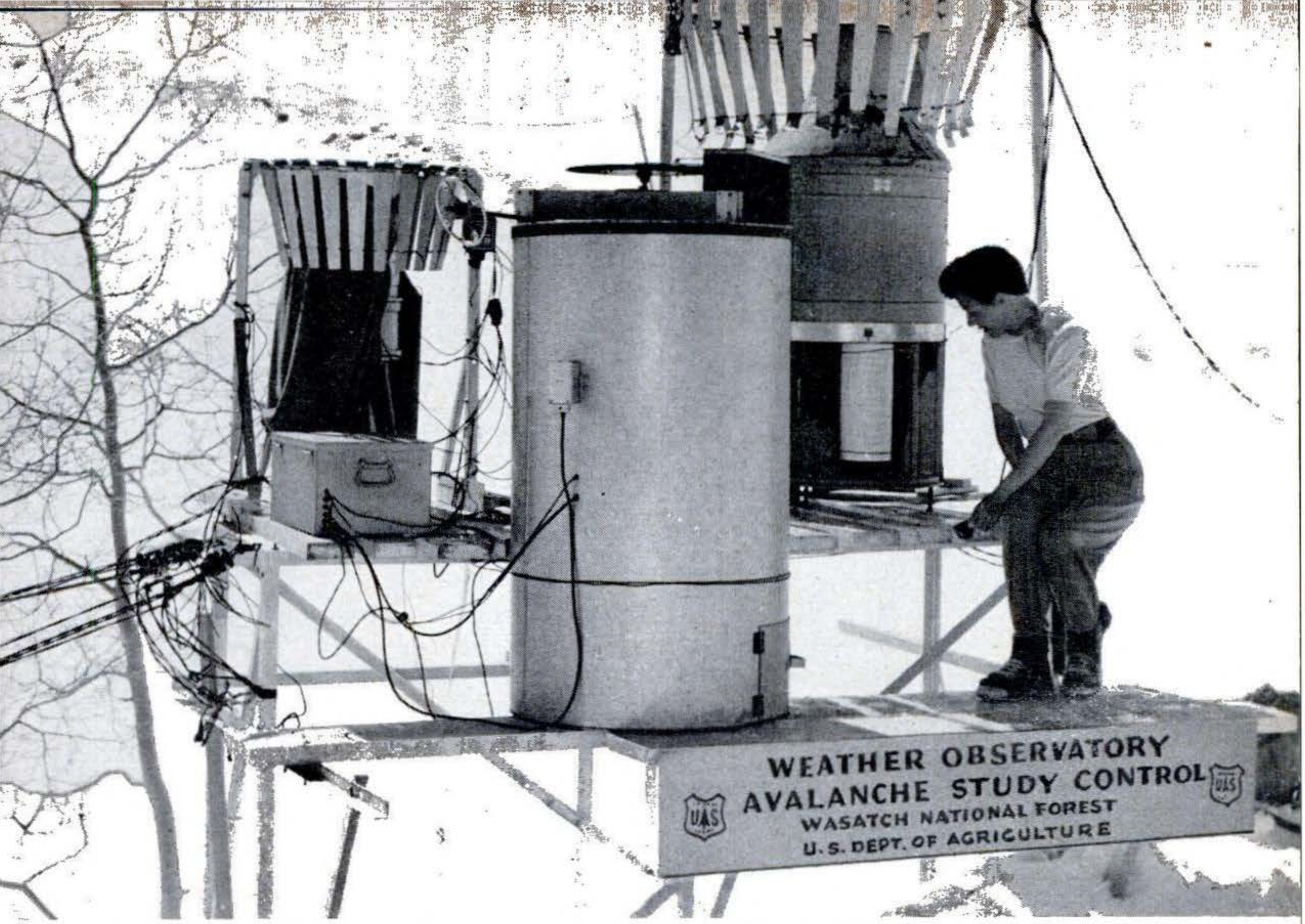

Avalanche station's tower has rate-of-snowfall meter (foreground) and precipitation gauges.

turntable, an electric eye flashes an impulse to an automatic recorder in the heated ranger station 150 yards away, and a brush sweeps the turntable clear for another measurement. Two precipitation gauges, one direct-indicating and the other wired to the indoor recorder, melt the fallen snow and show its moisture content.

A new "hazard chart," a revolutionary development in avalanche forecasting, takes into account these instruments' readings and other data—wind speed and direction, temperature fluctuations, previous snow depth. "When the hazard scale gives us a score of what we call 'plus three,' we know the avalanche situation is dangerous," Monty says, "so we shut down ski trails in the danger zone."

Shooting Down Snowslides

To get potential slides out of the way, the rangers have successfully tried high explosives. When hand-placed charges

INDOOR RECORDER at Alta, Utah, station is electrically wired to array of instruments outside. By combining their readings, its moving paper chart warns of avalanches in the making.

WEAPONS in avalanche fighters' arsenal include strings of high-explosive demolition charges and 75-mm. shells (above) to give potential snowslides a deliberate start and get them out of the way. Demolition charges are laid atop snow, set off electrically (left).

can be used, they employ tetrytol—a military demolition agent more powerful than TNT—in half-pound blocks or chains of sticks. At snowcaps beyond reach, their artillery fires 75-mm. high-explosive shells.

Rangers at Alta recognize several types of avalanches. Those of dry snow are fast-moving, quick-spreading, dangerous if large—but usually start before much snow builds up. Moist slides, slower and heavier, give an alert person time to get away. Their chief threat is to buildings.

Most dangerous are "slab" avalanches. An unstable slab of snow, typically dull and chalky in appearance, may remain poised almost indefinitely—then suddenly give way. Movies of a slab avalanche show practically a whole slope in motion at once. Caught in one, a skier has virtually no chance to escape.

While slide victims have survived 72 hours' burial in the snow, usually anyone not killed outright soon perishes from suffocation, shock or exposure. Hence, the need of quick and expert rescue work, for which Alta's training is considered tops.

Alta Pays Off in Lives

Once Alta was notorious as a graveyard for avalanche victims. Since the Forest Service set out to tame the slides, only two skiers who defied warning signs have met with an accident. One was killed, the other rescued.

So well is Alta's slide-forecasting station paying off that it has set the style for other skiing centers and two stations like it have been set up since, one at Stevens Pass, Wash., the other at Bethoud Pass, Colo.

"SLIDE AREA" SIGNS, set up by rangers whenever field tests and forecasting instruments show an avalanche threatens, save lives by warning skiers away from danger zone.

RESCUE TEAMS practice probing with poles for dummy, hidden beneath snow, and digging it out. Quick work saves buried slide victims from death by suffocation, shock or exposure.

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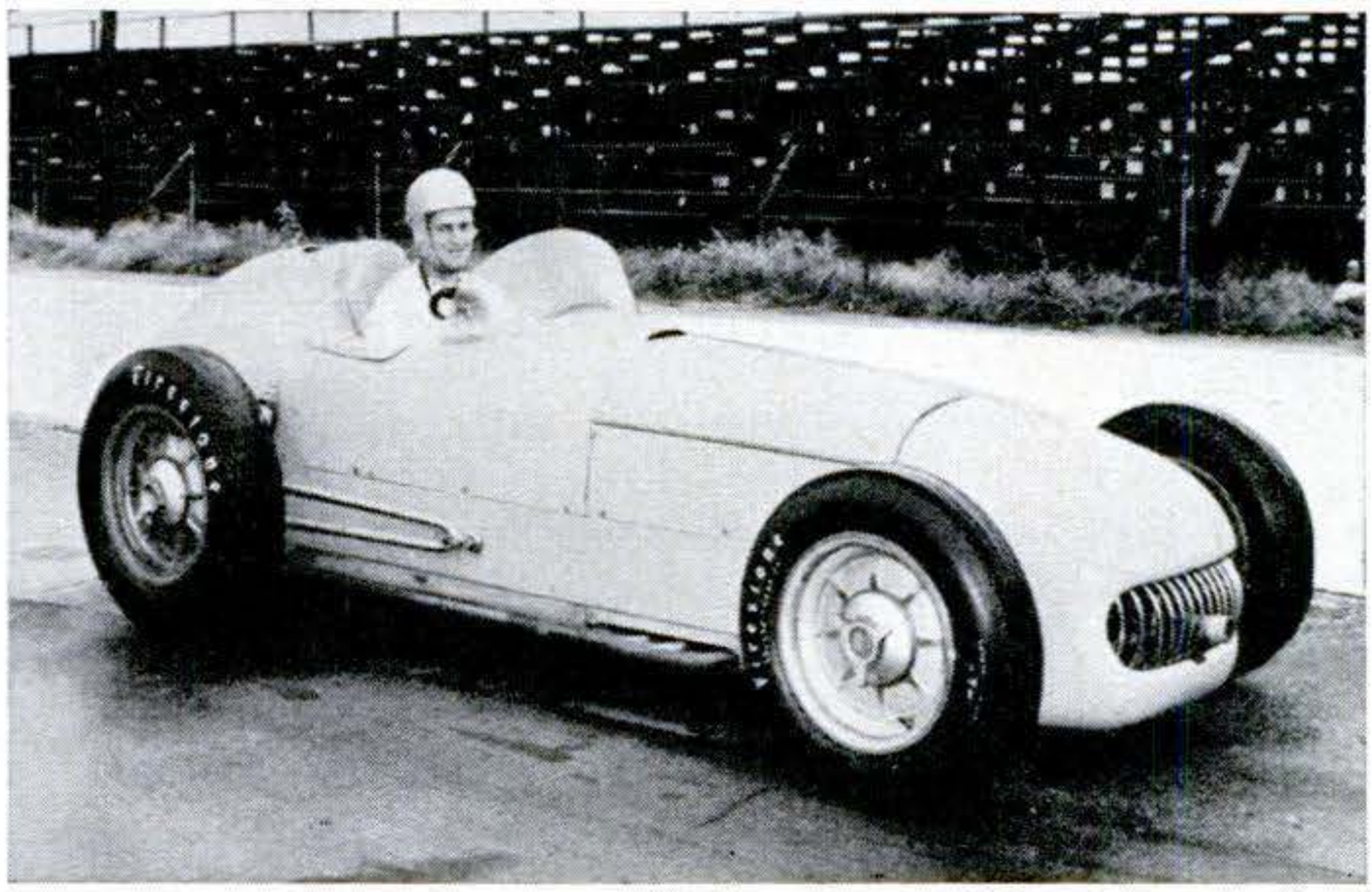
Biggest 'Copter Heads Upstairs

HERE's the largest helicopter ever built in this country—the XH-17. Looking like some weird insect with its four dangling legs, it is shown shaking the dust from its wheels for its first extended test flight.

Two GE turbojets spin the blades which measure over 125 feet from tip to tip. Height of the Hughes craft is more than 30 feet. The Air Force expects to use big 'copters to lift and deliver heavy artillery, bridge sections and trucks.

Chrysler-Powered Racing Car Does 135 M.P.H. for 140 Miles



THIS racing car whizzed over Indianapolis Speedway straightaways doing 170 m.p.h. in test runs and logged an average of more than 135 m.p.h. for 140 miles. The official Speedway record for 100 miles, held by Bill Vukovich, is 133.008 m.p.h.

A Chrysler V-8 engine, producing more than 400 hp. without supercharging, gives the car its zing. R. G. Wolcott is the owner and Joe James the driver.

Model Blimp Flies to Help Recruit Navy Air Cadets

A BABY blimp has taken on a full load of helium for a take-off to help recruit Naval Aviation Cadets. A miniature ZP2K airship (right), it is powered by two model-plane engines in outrigger nacelles.

The cabin houses a radio-control receiver and mechanisms for moving elevators and rudder. Lt. John Kane of the Naval Air Station, Lakehurst, N. J., fabricated the gas bag. Ray Benton, a professional model maker, built the cabin and tail.

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WINNER COPS THE FLAG at Juarez, northern terminus of Mexican Road Race, after covering treacherous 1,934-mile course in elapsed time of 18 hours 51 minutes 19 seconds.

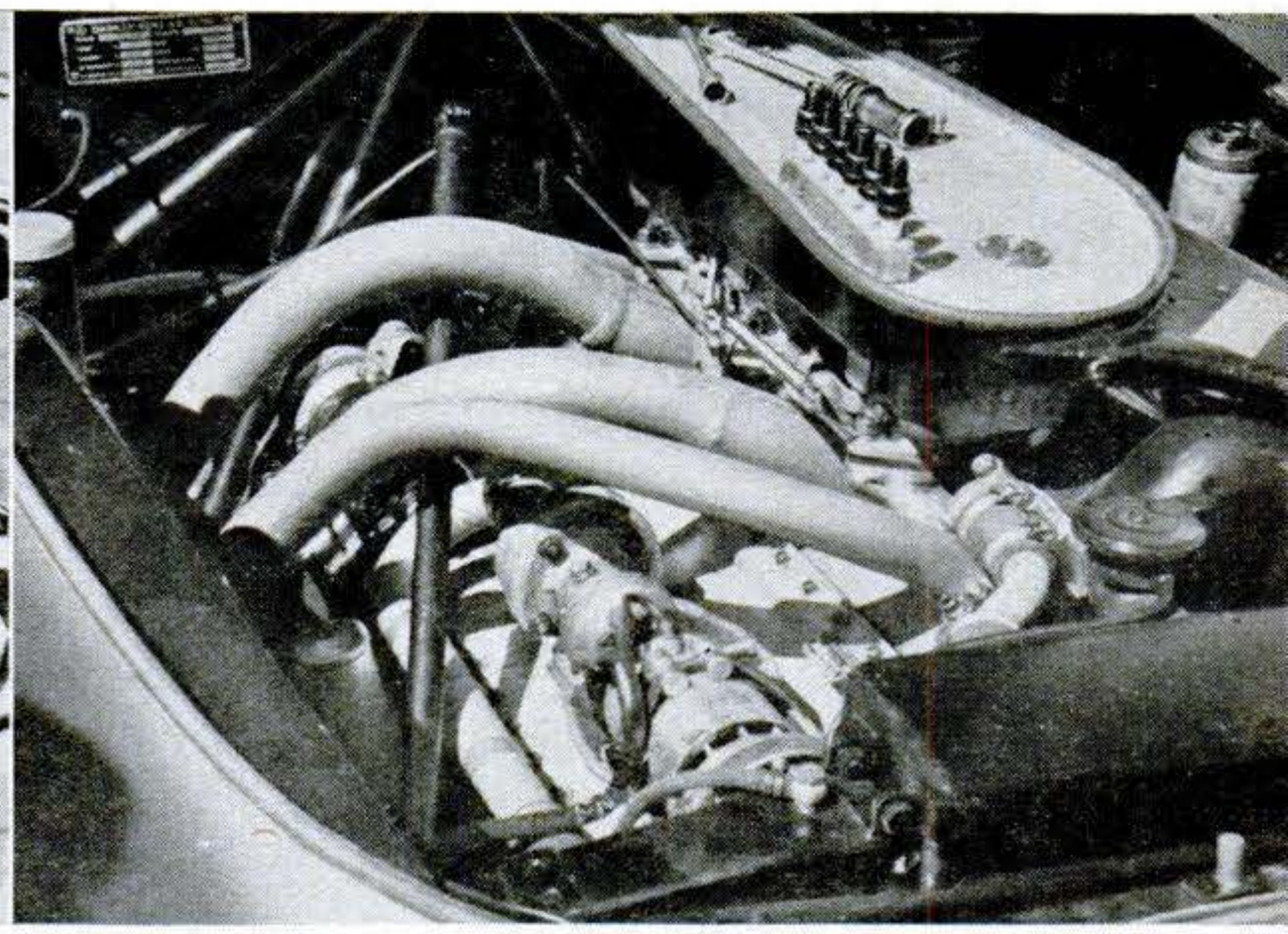
Mercedes Shatters Road-Race Record

AVERAGING 102 miles an hour for almost 2,000 miles, a light Mercedes sports car blew the previous 88-m.p.h. record to bits in the 1952 running of the world's toughest speed test—the Mexican Road Race. Karl Kling of Stuttgart, Germany, piloting a Mercedes 300 SL, raked in the winner's chips—$17,442. Another Mercedes was second.

Stock-car honors went to America's most powerful production automobile, the 1953 Lincoln (see p. 110), which took the first *four* places. Chuck Stevenson, AAA champ from Fresno, Calif., was first, averaging 90.

Of the 27 sports cars and 55 stock models that roared out of Tuxtla Gutiérrez, near Mexico's southern frontier, on Nov. 19, 43 never reached the finish at Juarez, across the line from El Paso, Tex. One driver was killed, 14 cars wrecked, the others forced out by mechanical failure. Mercedes, which also won the big Le Mans race in France last summer, appeared to be making good its boast of supremacy in road racing.

BARS FOR THE BIRDS. Karl Kling, the winner and new champion, looks out through bars installed on his Mercedes to protect him from buzzards flying into the windshield.



CLOSE-UP OF 173-HP. ENGINE that powered German racer. Bosch spark plugs lined up on air cleaner were removed for prerace tune up. Car has three Weber carbs.

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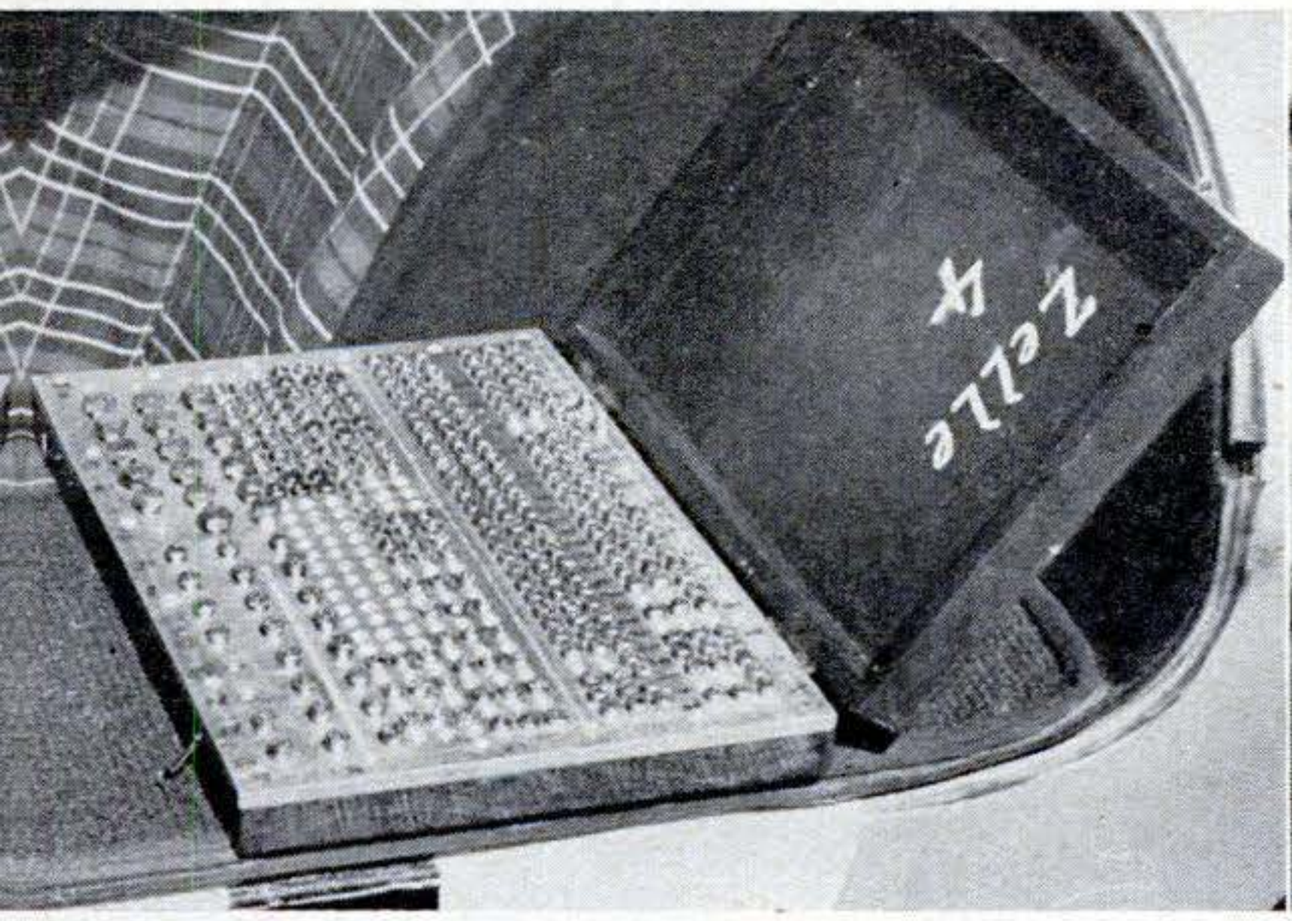
LIVESTOCK WOULDN'T STAY ALIVE LONG—and neither would the racers—if sheep and cattle were not shooed off road. Race route was guarded by 50,000 Mexican soldiers. Open Mercedes above was disqualified when driver returned to starting line for adjustments.



WITH TYPICAL GERMAN THOROUGHNESS, the Mercedes team brought along several hundred carburetor jets, to permit every possible adjustment for different altitudes.

ZIGGED WHEN HE SHOULD HAVE ZAGGED. Felice Bonetto tells how he went off road, wrecked car. He wasn't only one who ran into bad luck—only 39 of 82 finished race.

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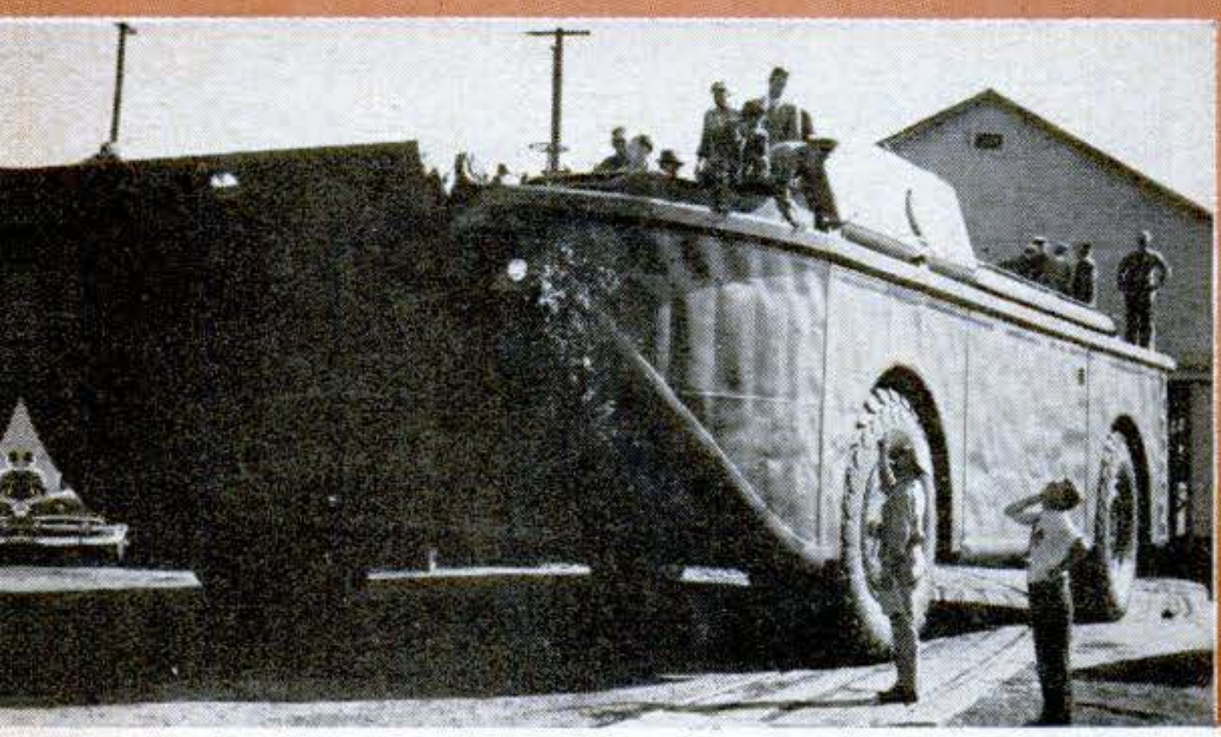
Army Amphibian Has One Motor per Wheel

BIG enough to deliver the latest medium tank from ship to shore, this new 60-ton amphibious cargo carrier for the Army dwarfs the World War II Duck. Over-all length is 61 feet. Afloat (right), twin screws propel it; on land (below), an individual 165-horsepower Diesel engine turns each of the monster's 9½-foot wheels. It's called the Barc (Barge Amphibious Resupply Cargo.)



It's Low, Wide and Gold

LOWEST and widest sports car ever built—that's what Johnny Campbell and Elbert Dooley call their gold-painted Cado (below.) The two Cleveland mechanics built the chassis and six-foot-wide steel body around a 160-horsepower Olds engine. The Cado is so low—clearance, nine inches; height, 36½ inches—that the driver can step over the side when the top is down. The car is valued at $4,500.

Plastic Streamlines Rocket Pod

THE plastic cover below, being slipped over the nose of a wing pod on the Lockheed Starfire, disintegrates a split second before the rockets fly. Gas pressure of the burning propellant blows it apart. The wing pod, which packs a dozen 2.75-inch rockets, is one of a pair being added to the jet's armament. These "side arms" double the plane's firepower—it carries two dozen rockets in its nose.

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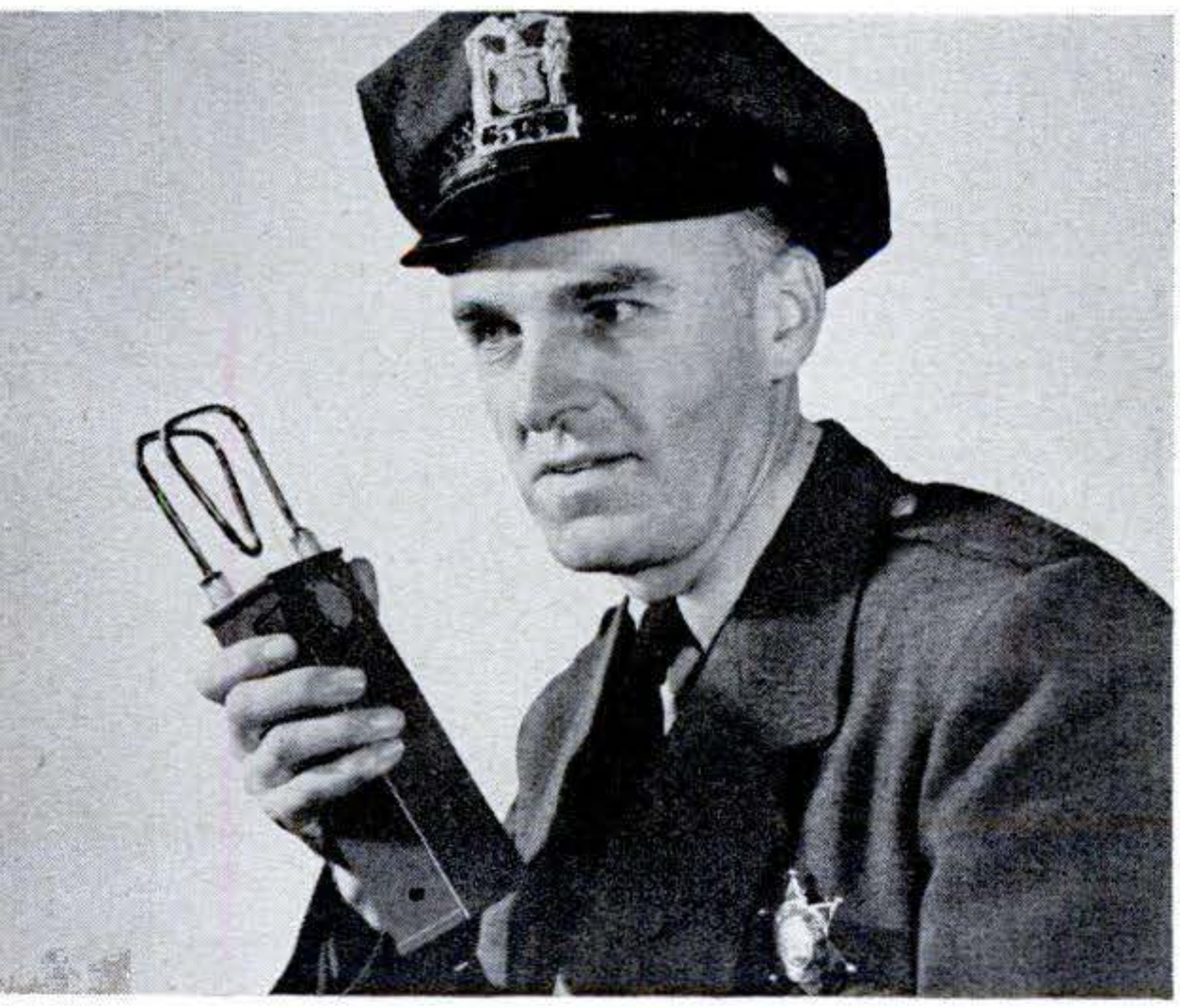
Cops Get Pocket Radio

SMALLER than a cigarette carton, the outfit below is a self-contained radio transmitting station for policemen, firemen and railroaders. A loop antenna doubles as a carrying handle for a case holding microphone, dry cells and eight tubes with a printed circuit. Weighing less than two pounds, the Motorola-made set operates on a frequency range of 152 to 174 megacycles and has a range of five miles.



They Say Now.....

"The eradication of tuberculosis is not inconceivable."—DR. E. H. ROBITZEK, ANTI-TB-DRUG PIONEER.

"There is a possibility of a quite appreciable change in the world's climate [to dryer and warmer] in 25 to 50 years."—DR. C. E. P. BROOKS, BRITISH METEOROLOGIST.

"More trained workers are needed to investigate the still unsolved problems of public health."—BRIG. GEN. JAMES STEVENS SIMMONS, DEAN, HARVARD UNIVERSITY SCHOOL OF PUBLIC HEALTH.

"It is now possible to have a complete 'family' of atomic weapons, for use not only by strategic bombers, but also by ground-support aircraft, armies and navies." —GORDON DEAN, CHAIRMAN, U.S. ATOMIC ENERGY COMMISSION.

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P.S.

Last minute news & notes...

ATOMIC POWER on a commercial scale will come sooner in England than here, predicts the "Wall Street Journal," New York business newspaper. It's not that U.S. research lags behind Britain's--the reason is economic. With conventional power more expensive there than in this country, A-power doesn't face as stiff competition. Construction is expected to begin within a year of a British atomic-power plant with a capacity of 150,000 to 200,000 kilowatts, enough to supply a good-sized city or to propel the liner Queen Mary.

HEARTS THAT HAVE STOPPED BEATING have been started again by a "thyratron stimulator," a newly perfected medical aid that prods the muscles to action with timed electric impulses. In one life-saving case reported, it kept a patient's heart pumping for five days before normal heartbeat resumed.

ENTIRELY NEW DEVELOPMENTS since World War II make up 60 percent of all ordnance items the Navy is now buying.

WILL TAPE RECORDINGS, some day, supplant disk phonograph records? What might be a pioneer step in that direction is appearance on the market of sound-tape records--"Magnecordings by Vox"--of major orchestras with noted conductors and soloists. They're made at standard 7½-inch-per-second speed, and priced according to length (a full hour's program costs $9.95) by MaVoTape, Inc., 225 W. Ohio St., Chicago.

A GAS-TURBINE POWER PLANT ON RAILS will be built for the Army Corps of Engineers by Westinghouse. First of its kind, the 5,000-kilowatt mobile generating station will travel on two railway cars.

SKYWRITING IN COLORS recently made its debut over New York with an advertising message in yellow smoke. It's done by flushing oil and a dye into the plane's exhaust.

DID AN H-BOMB GO OFF at Eniwetok Atoll last November? Unofficial consensus, based largely on eyewitness accounts, was that one did. The AEC wasn't saying. Only official statement, more guarded than some of the headlines it inspired, was that the tests included "experiments contributing to thermonuclear weapons research." Actually those were exactly the same words that the AEC had used after its "Greenhouse" tests a year earlier, PSM files revealed.

WASHING CLOTHES IN COLD WATER will be possible with detergents of the future, predicts a leading soap maker's chief chemist, N. W. Ziels of Lever Brothers Co. Then washing machines won't tax the limited capacity of some home water heaters.

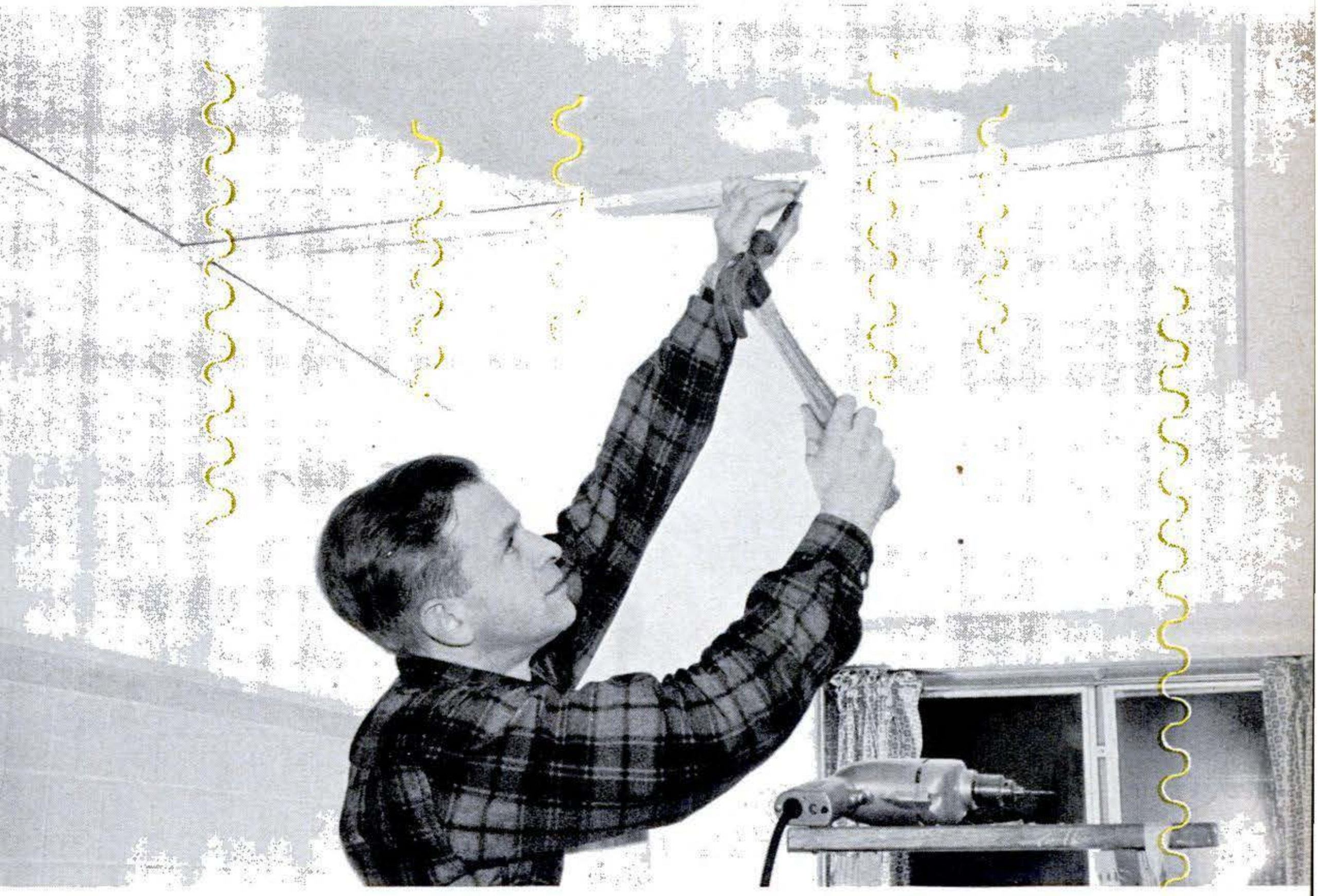
DO LIE DETECTORS tell the truth? Experts are almost evenly divided as to whether polygraphs are reliable enough for courtroom use, according to a survey by two University of Tennessee professors. But use on criminal suspects before trial and on key business and governmental personnel won four-to-one approval from 700-odd psychologists, criminologists and personnel officials.

BOTH HEAT AND COOLING are offered by a new window-type air conditioner for year-'round use. Its heating element warms the air and takes the chill out of a room on cool spring and fall days, when central heating is not in use, and in winter before the heat comes up. Maker is the Mitchell Mfg. Co., Chicago.

A TRIP TO THE MOON with Long Beach, Calif., as its point of departure is proposed by members of the Pacific Rocket Society. To build the rocket, they suggest that the city provide a modest $1,000,000, from its oil-royalty fund of $130,000,000. The moon journey, they argue, would be "a dramatic gesture to replace the present annual 'Miss Universe' beauty carnival."

The Editors

Like homeowner John Kirby, you can install a sheet of conductive rubber that will supply radiant heat for that extra bit of warmth.



Electric Ceiling Heats His Bathroom

IF YOUR bathroom needs supplementary heat to drive away goose pimples, you can supply it by hiding an electric heater in the ceiling.

The flip of a switch then will let you bathe and bask in the warmth of radiant heat. The heater itself is a most unlikely looking object—a rubber panel, no thicker than heavy cardboard, with an electrical junction box jutting from the corner of one

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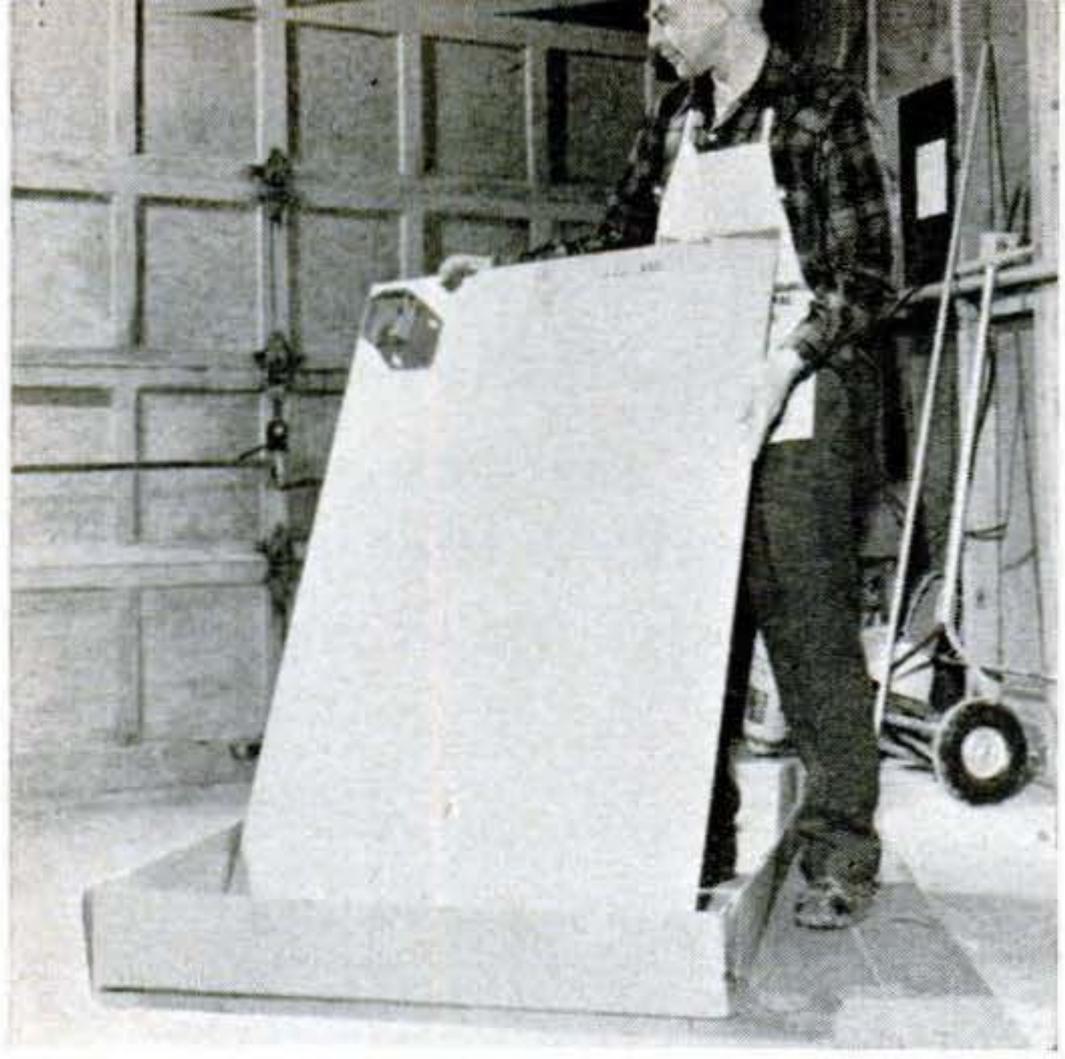


1 HERE'S THE HEATER—a 36" by 48" Uskon panel. The 115-volt type can be connected to the conventional 20-amp. house circuit. Note junction box at upper left corner.

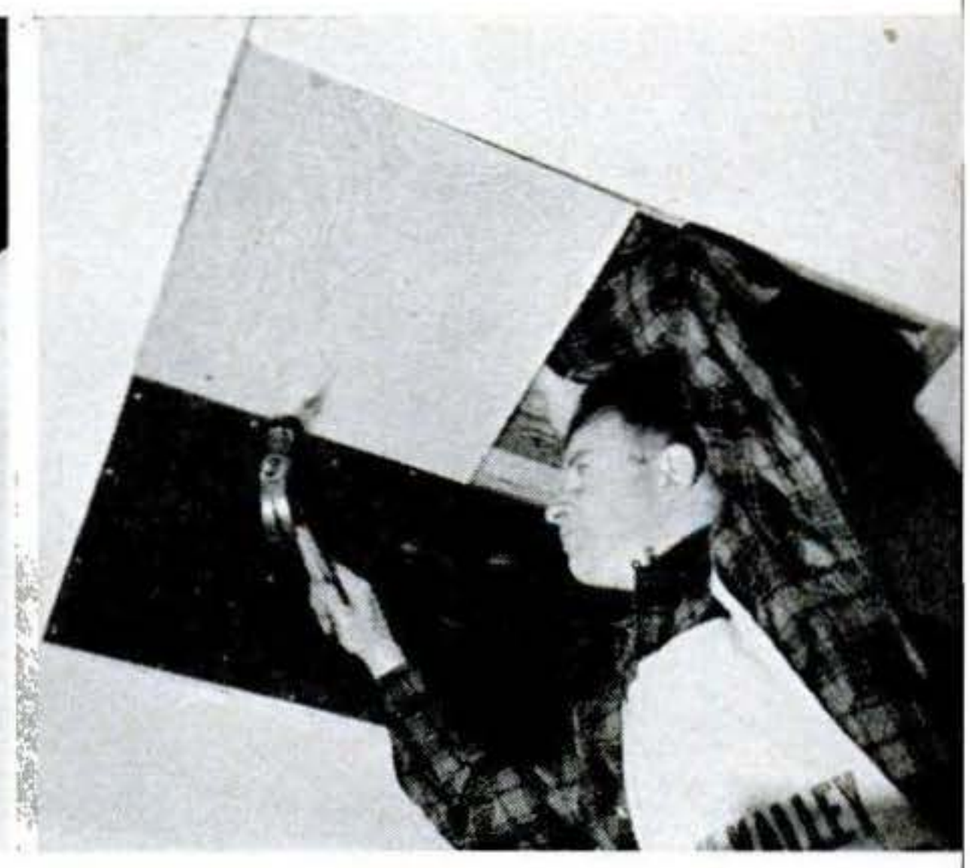
surface. Carbon black makes the rubber electrically conductive.

The U. S. Rubber Co. introduced these Uskon panels five years ago (PSM, April '48, p. 122). Since then, the rubber ceiling panels have been installed as the only heating system in many homes located in areas with low electrical rates and mild winters. Where rates are high, operating costs make other home-heating systems more economical.

That extra bit of heat. Wherever you live, a single Uskon panel adds up to a lot of sense dollar-wise if all you need is supplementary heat. John Kirby, who installed a panel in his bathroom ceiling by the techniques shown in the accompanying photos, wound up the job for about $35. Used only when needed, the heater does not add ap-

2 PAINTING IS EASIER if done before panel is installed, so John Kirby put on a prime coat as first step in installing a panel in the bathroom of his home in Mount Vernon, N. Y.

3 PANELS WERE HUNG by drilling and countersinking holes for No. 8 flathead screws at 8" intervals. Holes were aligned ½" from edge. Space 1½" from edge is nonconductive.



4 AFTER CUTTING ceiling hole, Kirby nailed up ¼" plywood and hardboard shims to bring thin Uskon down to level of ceiling material. Hole was cut in one piece for junction box.

5 PANEL WAS SUPPORTED with a T formed from scraps of lumber while 1¼" screws were driven. Screws are countersunk to allow use of molding to cover the joint.

6 WIRING WAS DONE FROM ABOVE, although connection might have been made from below before panel was raised. The entire area was insulated with mineral wool 4" thick.

preciably to the electric bill for his home.

Standard Uskon panels draw 22 watts to the square foot. They come in 115 volts for supplementary heating (these can be wired to ordinary 20-amp. household circuits) and 230 volts for heating large rooms or whole houses. Thus, the 115-volt, 36″ by 48″ panel that Kirby used draws 264 watts—little more than a refrigerator, which runs far more frequently than you normally would use the heater.

Installing a panel as Kirby did is little more difficult than putting up a piece of wallboard. You must cut a hole in the ceiling —or wall if you want the heater there—to suit the size of the panel, usually 36″ square or 36″ by 48″. The panels cannot be cut.

Insulation is a must. A unit without insulation behind the panel is wasteful of heat. Most paints, including water-based ones, will cover Uskon, but with oil paint it is best to prime first with shellac or aluminum paint. Wiring consists only of running a cable from the house circuit through a wall switch or thermostat to the two binding posts in the junction box on the panel.

A new thin type of Uskon that U. S. Rubber recently announced (see next page) is also comparatively easy for the homeowner to install. This is simply cemented in place. You could install it over plasterboard or other rigid material or over an existing plaster ceiling if it is fairly smooth.

Thin panels cost less. With 4′ square panels of the original type costing $30 each plus freight from Passaic, N. J., installed costs have been high. The usual figures per square foot of house area have been $1 to $1.25 in the South and California, around $1.50 to $2 in such areas as Chicago and the East Coast.

How to Estimate the Cost of Electric Heat

ELECTRIC heat is clean, pleasant, safe, easily controlled and takes up little space. In one or another of its forms it can be installed at costs not out of line with other heating.

But big power bills can take the joy out of it. And make no mistake: unless your electric rate is fairly low and your house is thoroughly insulated, its operating cost can be far higher than other systems'.

The following formula will give you an estimate of the annual cost of heating your home with electricity:

1. Find the cubic footage to be heated: length times width times height of the space in your home.
2. Ask the weather bureau or utility company for the average number of degree days in your locality. A degree day is a standard of measurement for heat requirements.
3. Multiply the degree days by the cubic footage, multiply this product by three, and divide the total by 10,000.
4. Multiply this figure by your kilowatt-hour rate and the result will be an estimate of how much it would cost to heat your home per year.

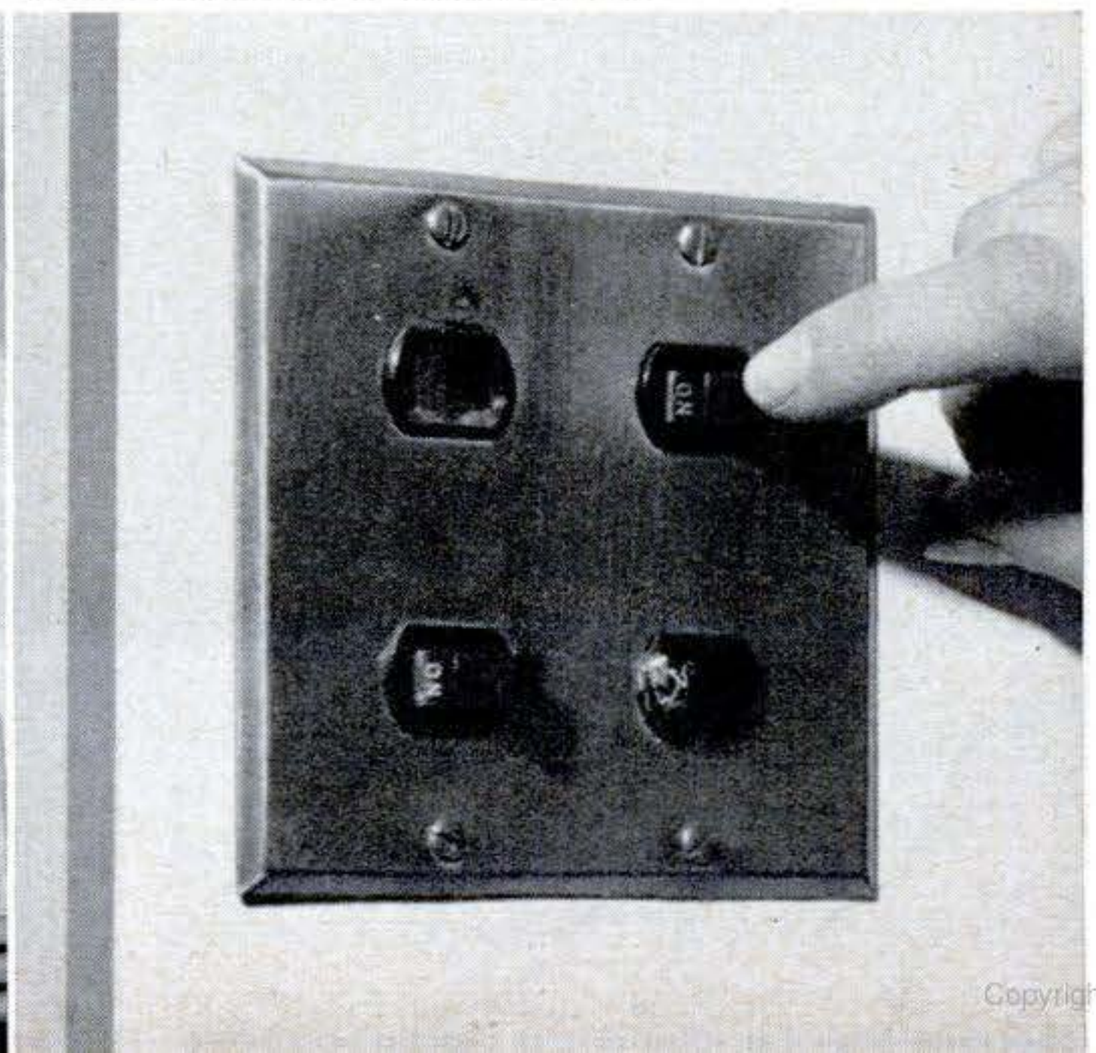
In contrast, a 4′ by 8′ panel of the new type (including the raceway) sells for $34.50 plus delivery. With this type, contract figures are expected to run 30 to 40 percent below former costs.

Both types of Uskon will remain on the market. The original, which has a ¼″ backing sheet of asbestos cement, will be used primarily in special installations where rigidity is required, for instance in some factories or office buildings.

Please turn the page for more on ceiling heat.

7 A FINAL COAT OF PAINT and you would never know the heater was there. Uskon panels should be spaced 1/16″ from each other or rest of ceiling to allow for expansion.

8 SWITCH AND PILOT-LIGHT UNIT was installed in wall to control heater for short-period use. For steady heat, a thermostat could be substituted for wall switch.



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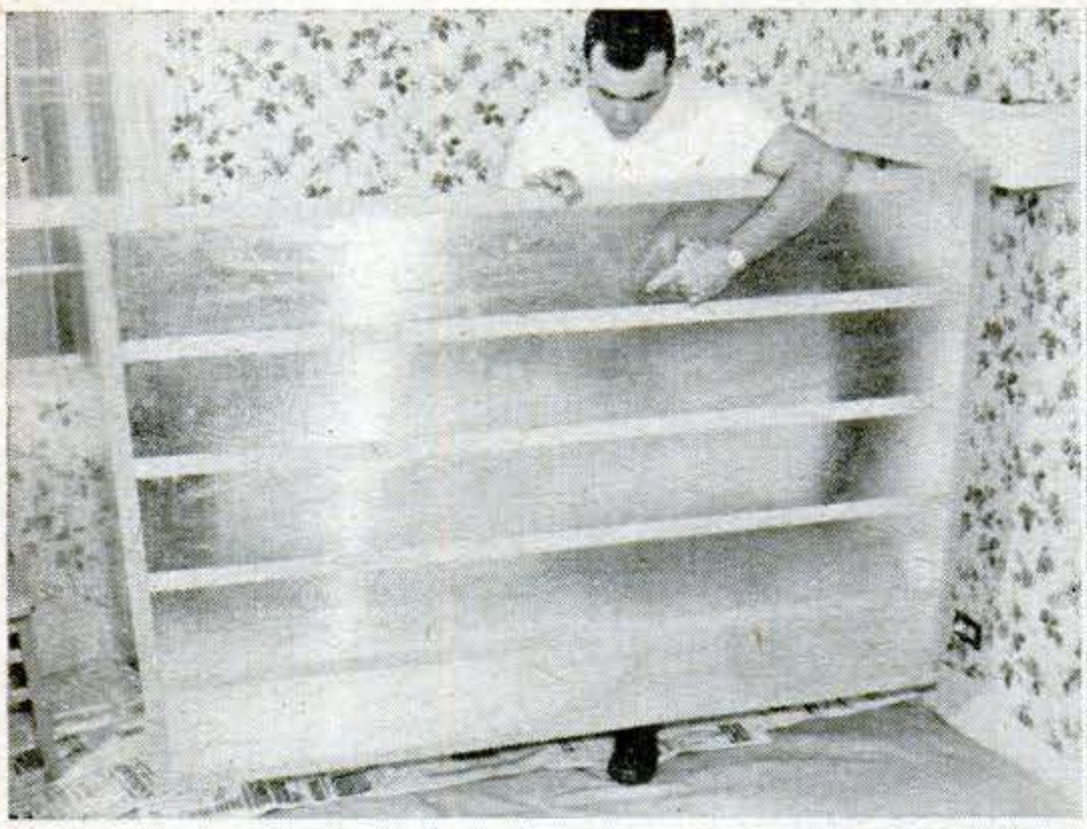
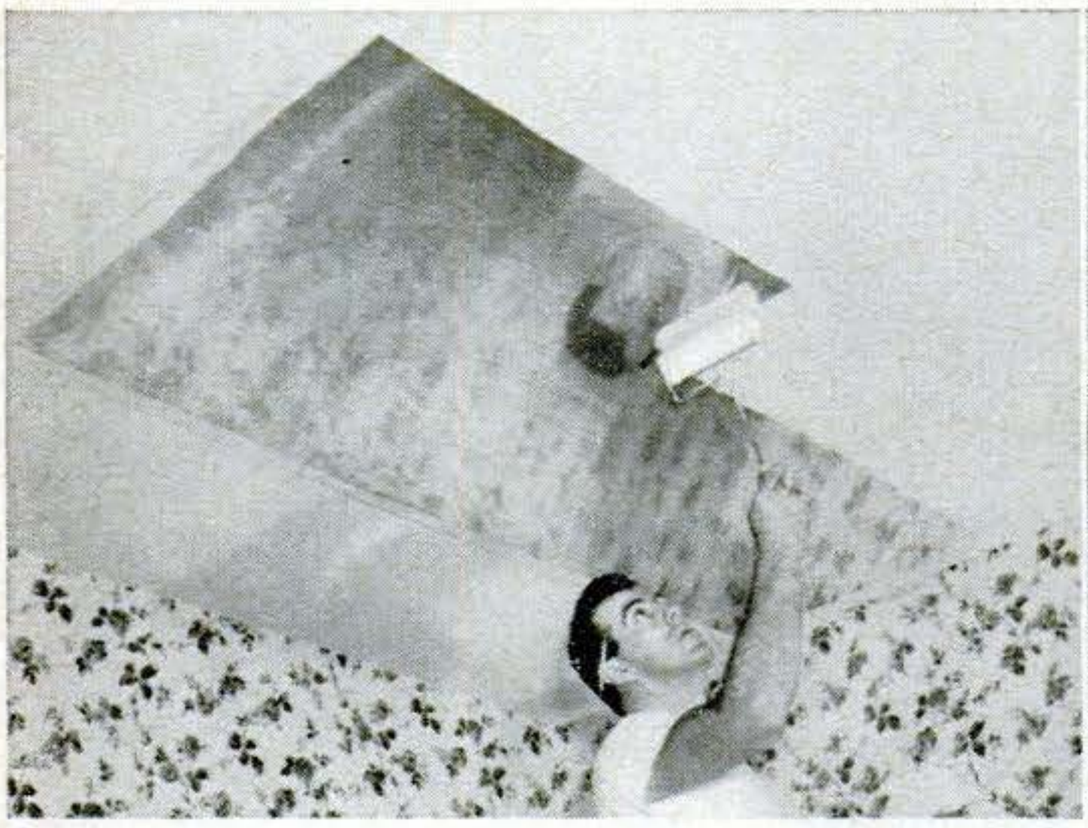
New Kind of Rubber Heat Panel Is Lighter and Costs Less

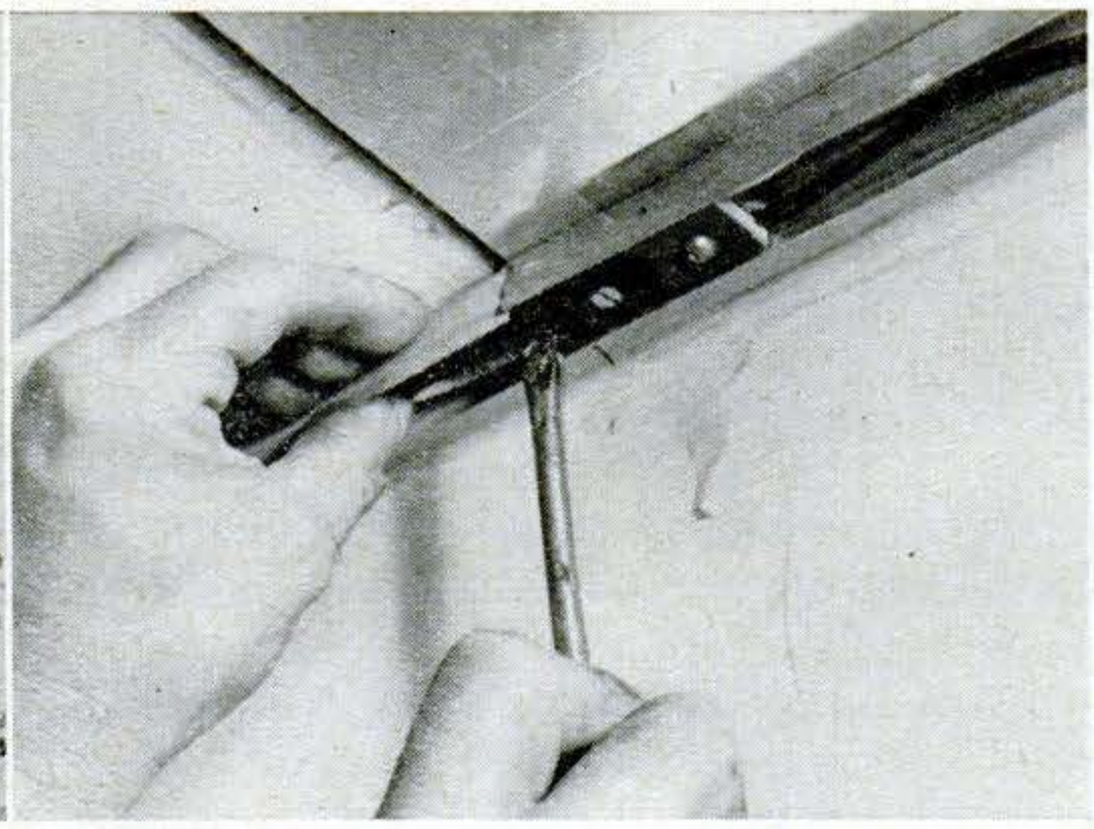


NEW USKON PANEL just introduced by U. S. Rubber Co. looks like this when it comes from factory. Called Type T (for thin), these panels are lighter and less expensive than rigid ones in use in recent years.

ADHESIVE IS USED to install thin heat panel over any smooth, rigid surface. Liquid adhesive is applied in strips to correspond to strips on panel. Panel is then pressed into place and a roller used to make it tight.



PAINT IS APPLIED with a roller or brush. New type of Uskon is so thin that a supplementary heating panel like this one becomes inconspicuous when painted to match ceiling. No molding is needed as for older type.



WIRES GO INTO NARROW RACEWAY where edge of panel meets wall. A cover is then snapped on to conceal the wires. A raceway is included with each Uskon panel. Wiring supplies are standard and may be obtained anywhere.

Types of Electric Heat and Characteristics of Each

Space heaters. The cheapest to buy, these work well in mild climates. Convection types may not distribute heat evenly enough in cold weather. Those with fans make some noise.

Radiant glass panels. Although taking up considerable wall space, these produce radiant heat that is clean and comfortable. They usually respond quickly to changes in outdoor temperature. New narrow baseboard types fit into many rooms where the ordinary wider types are not feasible.

Resistance wire or cable. Buried in plaster ceilings, walls or concrete floor slabs, these are invisible and take up no house space. The installation cost is comparable to that of good warm-air systems. This type of heat, particularly if used in a slab, may be slow in responding to rapid temperature changes.

Rubber panels. These and other prefabricated panels for ceiling use have generally been the most expensive to buy, although lower costs promised for the new Uskon may level this out. The panels are so thin that they heat up in a matter of minutes and cool off just as fast, avoiding the lag that is a disadvantage of some other radiant heating systems.

Baseboard convectors. These are a comparatively new development. A baseboard around the room contains resistance wires that heat air as it passes through. Some types use fins or coils to expose a greater heating surface to the air.

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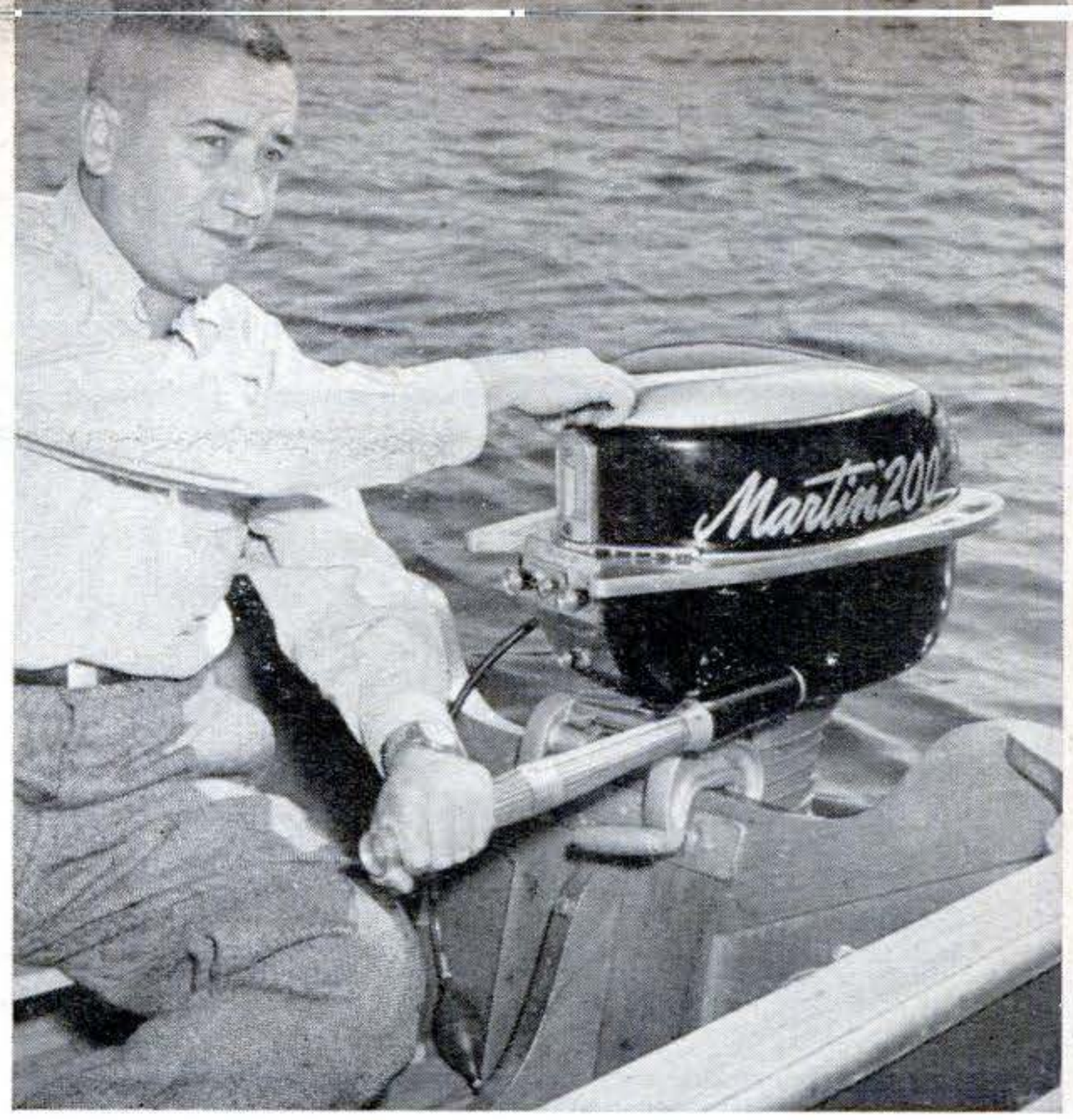
67 Lb. Give 20 Hp.

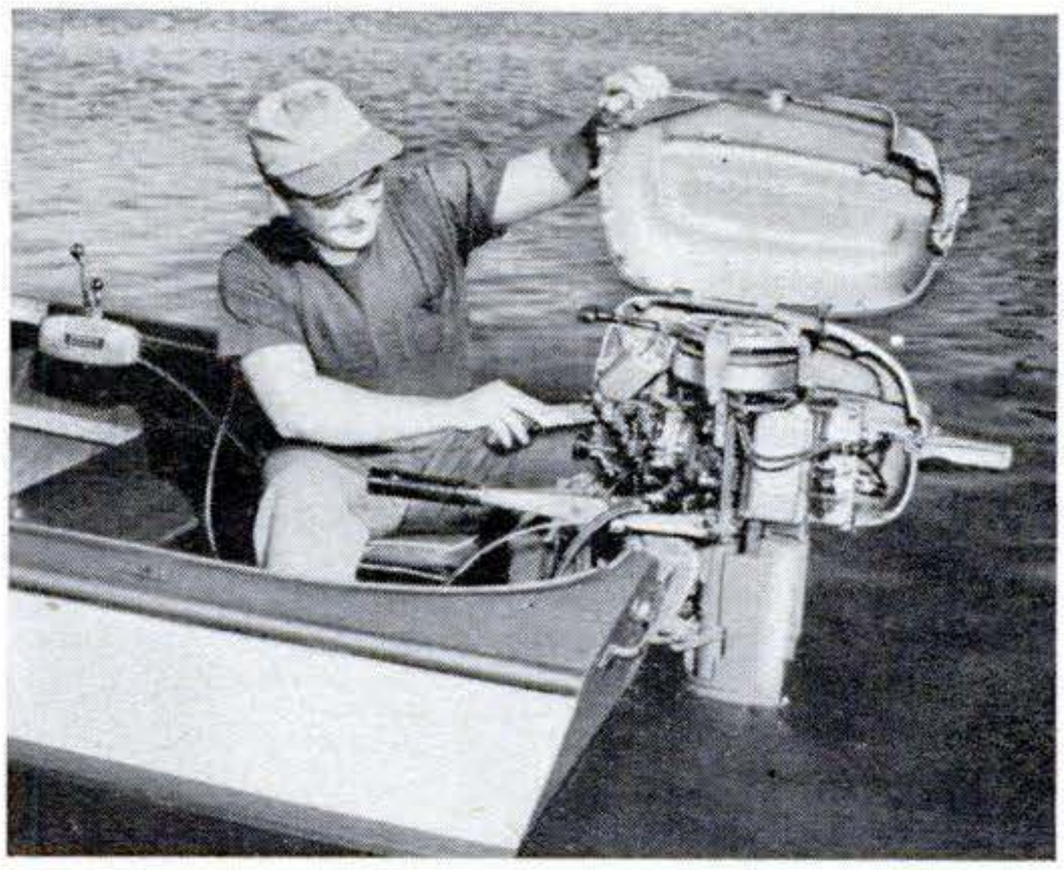


MECHANICALLY controlled intake poppet valves and an automotive-type fuel pump are incorporated in a twin-cylinder, 20-hp. motor weighing 67 lb. that was introduced at the New York boat show.

A control knob on the instrument panel permits the operator to switch the fuel supply from the motor's five-quart tank to a six-gallon auxiliary tank. The diaphragm pump—operated by exhaust pressure—in the power head moves fuel from the auxiliary tank, eliminating the need of air pressure in the tank.

Throttle control as well as the gearshift for forward, neutral or reverse are built into the steering handle. For remote control, the steering handle is removed and a plug-in attachment substituted. The motor also has a vertical stern adjustment that permits trimming from within the boat while it is slowly under way. Specifications include: bore, 2½"; stroke, 2 1/32"; piston displacement, 19.94 cu. in.; stern height, 15". *Martin Motors, Eau Claire, Wis.*

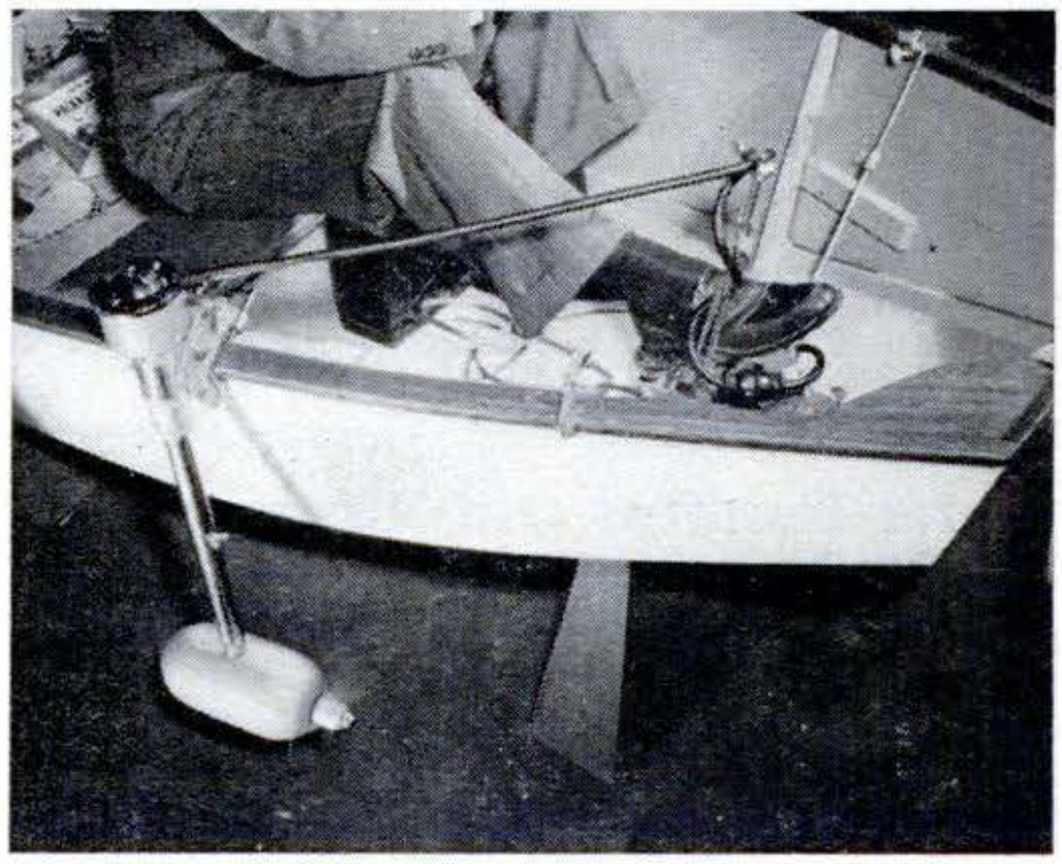
Motor Has Auto-Type Hood



AN ACOUSTICALLY tuned carburetor silencer and a water-sealed exhaust reduce the noise of this two-cylinder, 15-hp. motor by 20 percent, muting most high-frequency noise, according to the manufacturer.

For routine motor inspections and servicing, the port side of the hood can be raised (above) to a vertical position. The complete cover assembly can be lifted off after two screws on the starboard side are removed. Ignition and carburetion are synchronized in the steering-handle grip. A gearshift permits the motor to be started in neutral and then put into forward or reverse. *Evinrude Motors, Milwaukee.*

Foot Controls Trolling Motor



SLIGHT movements of one foot control this electric fishing motor. To steer it you push the pedal down or let it up; to change speed you tilt the pedal left or right. An auto battery powers the two-speed, 3-hp. motor, driving it for about 1½ days' fishing on one charge.

The motor can be clamped either on the transom or the side of a boat (above), where it will move the boat forward, backward or to either side. The electric unit can be folded up into the boat while an outboard takes you to your fishing grounds, then lowered to move you from spot to spot. *Silver Creek Precision Corp., Silver Creek, N.Y.*

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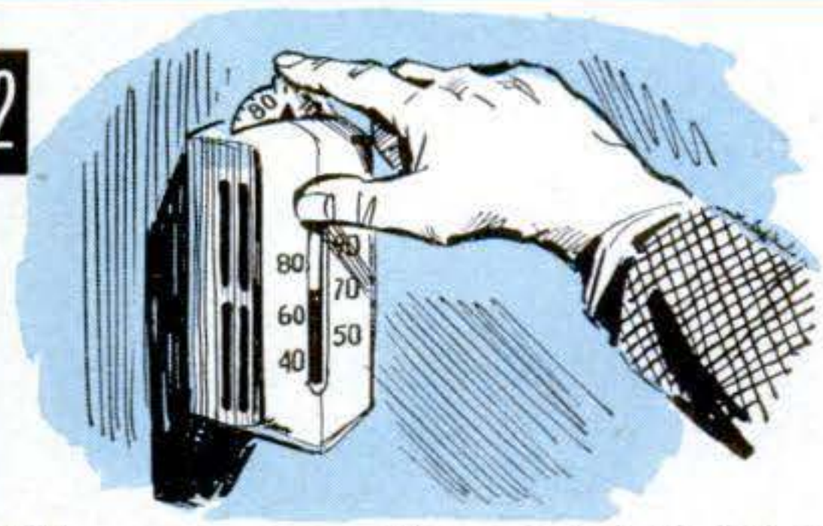
IF Your Oil Burner Stops...

1

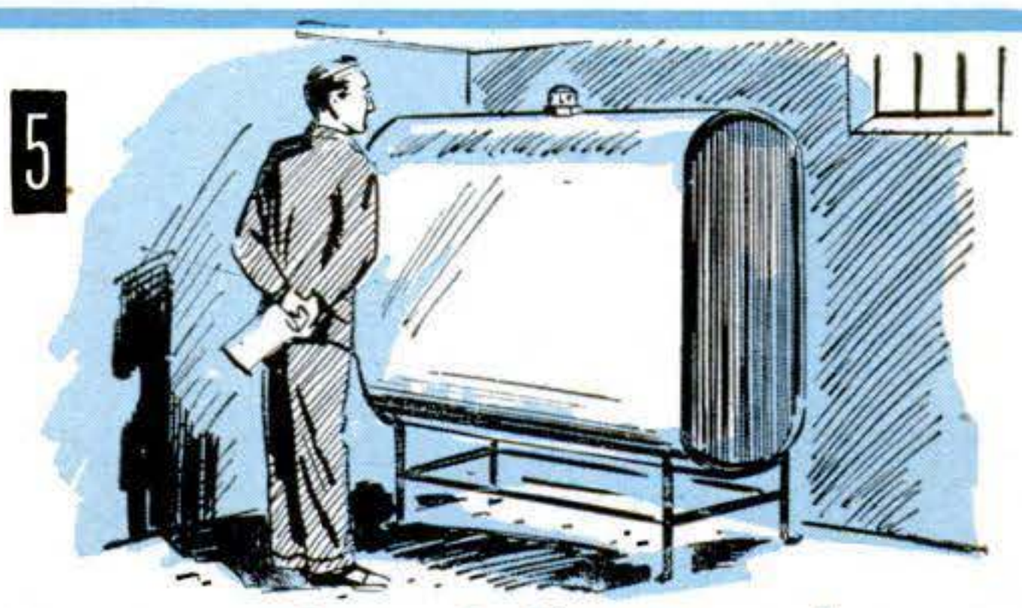
Try the lights to see if the house current is on. Servicemen will tell you that they always get calls when the power fails.

2



Make sure room thermostat is set at least 3° above room temperature. A burner may not operate otherwise. If you suspect the thermostat itself, remove cover and blow out any dust. If points are dirty, clean them gently by drawing plain paper between them.

5

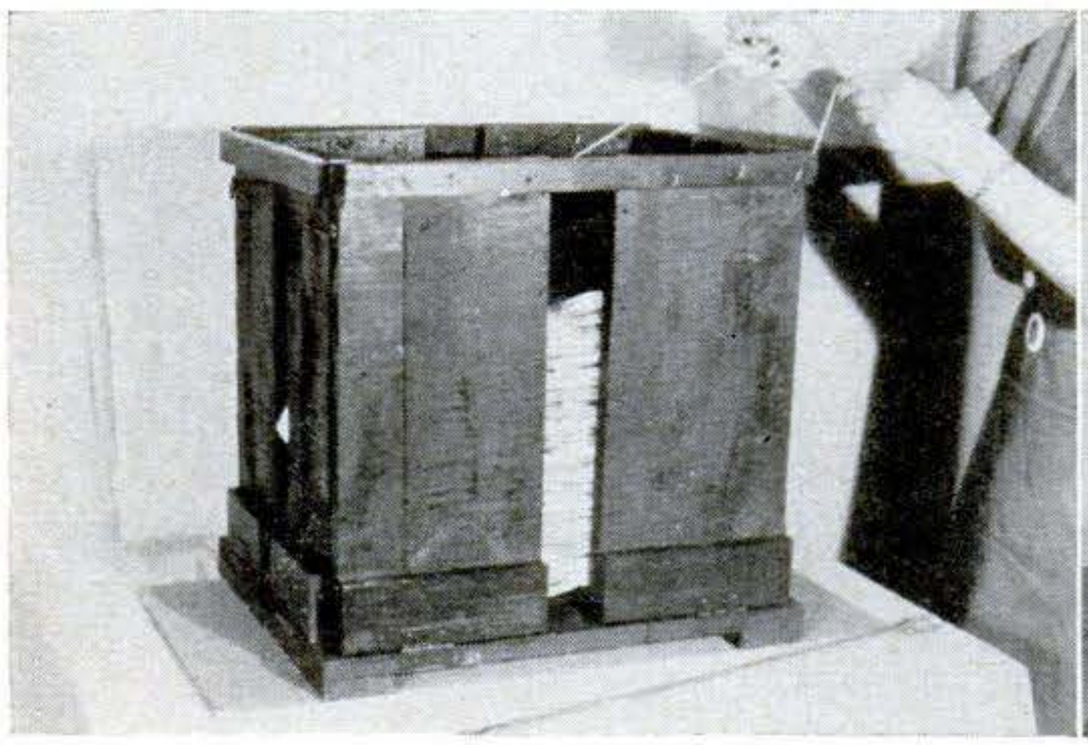


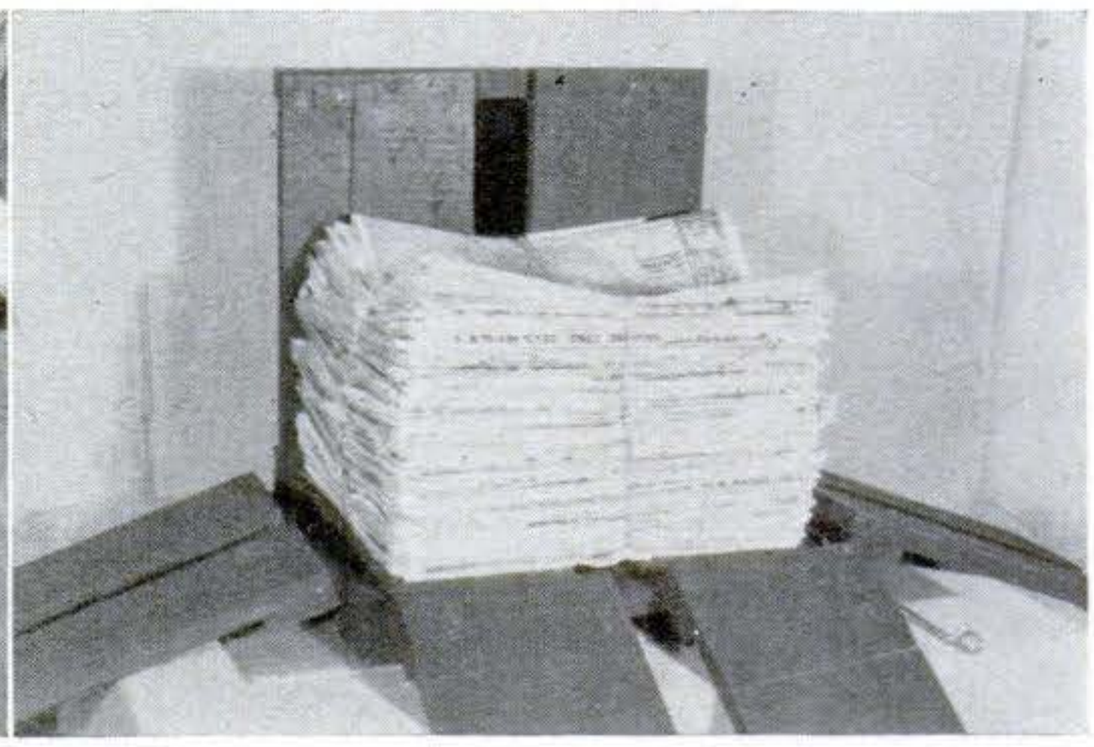
Be sure you have oil. If not, remember you may have to prime the pump after oil is obtained. The delivery man usually will do this. Also check the oil valve at the tank and the one at burner if there is one. Both must be on.

6

If it's a steam system, the low-water cutoff may have stopped the burner. Water in the gauge should be about halfway up at all times. The burner should start automatically when the correct water level is restored.

Baler Bundles Old Newspapers into Neat Package for Junkman





BEFORE I made this baler the storage of old newspapers between pickups by the junkman was always a problem. The front and both ends of the box are hinged to the base, and screen-door hooks hold the ends to the front and back.

Four blocks nailed to the bottom of the baler provide space through which a cord for tying the papers can be drawn with a wire hook. After the box is filled, string is pulled through slots in the box panels and tied. Then sides and front are let down and the bale of papers removed for pickup. *—T. L. Stalker, Flint, Mich.*

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Make these eight checks before you call in the repairman. If the trouble is minor, you'll save by finding and fixing it yourself.

3

See that master switch controlling the burner is on. A member of the family, perhaps a youngster, may have turned it off.

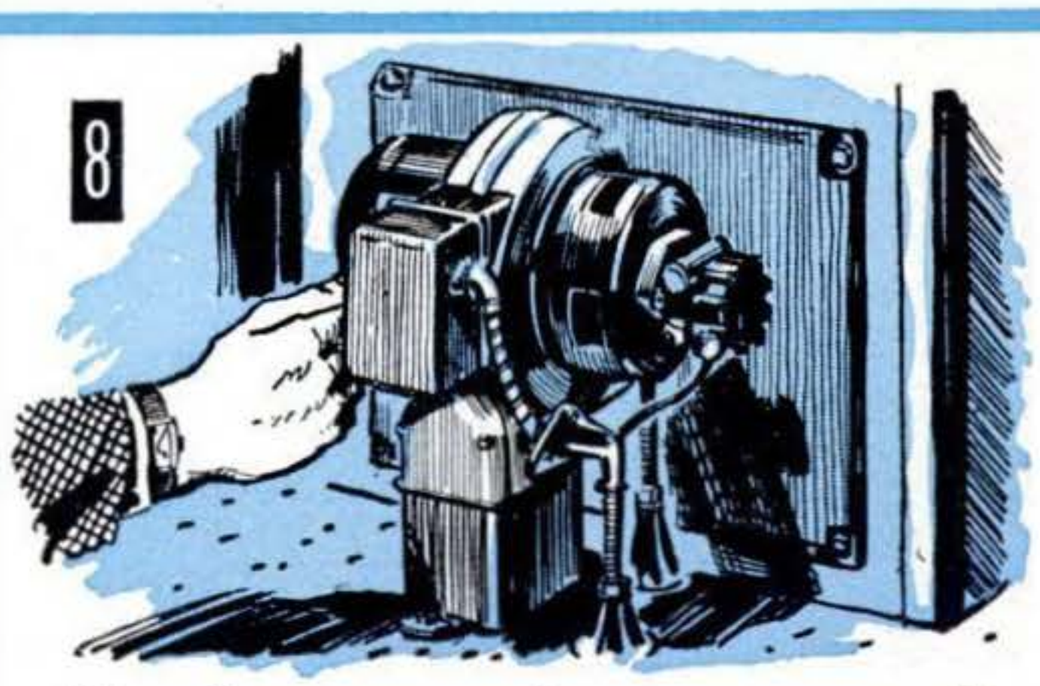
4

Check the fuses in the house fuse box and in the burner switch box. If a fuse is blown, replace it with one of equal amperage.

7

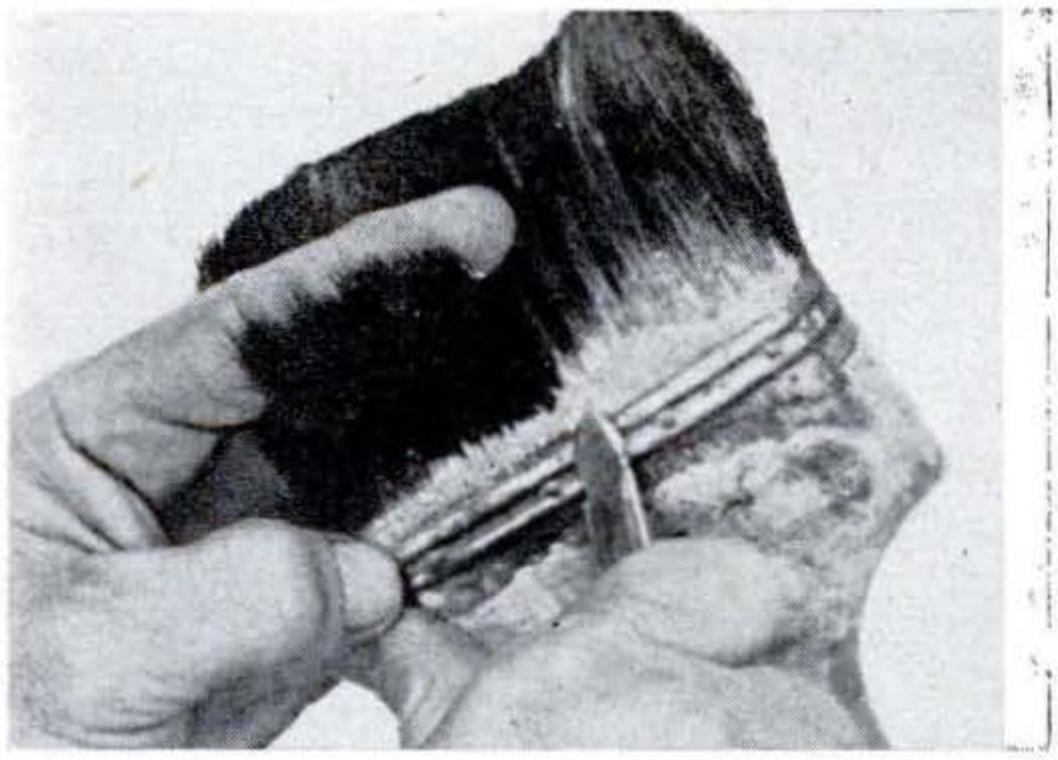
Press safety recycling button on the stack relay attached to the smoke pipe after making previous checks. (Open furnace door to relieve possible pressure build-up from oil fumes and stand away from door as you press the button.) If a normal flame appears but burns only a few minutes, remove the stack-temperature unit and gently clean soot off the end inserted in the pipe. Replace and press button again. If flame doesn't continue, call a repairman.

8



If no flame occurs when you press recycling button, press overload cut-out button (usually red) on motor—if there is one. If you still get no flame, call serviceman.

Trimming Renews Old Brushes



AN OLD paintbrush can be given new life by trimming away the worn outer rows of bristles. When these bristles are worn short, they destroy the original flexibility and spreading power of the brush. Use a sharp knife or razor blade.—*Clinton R. Hull, Costa Mesa, Calif.*

Kit Contains 48 Magnets

DESIGNED for shop or experimental use, the 48 permanent magnets in eight styles in this kit have a pull of up to two pounds each. Another kit is made up of 18 larger magnets with pulls of from three to 12 pounds. The kits are available from Carboloy, General Electric Co., Detroit.

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New for the Handy Man

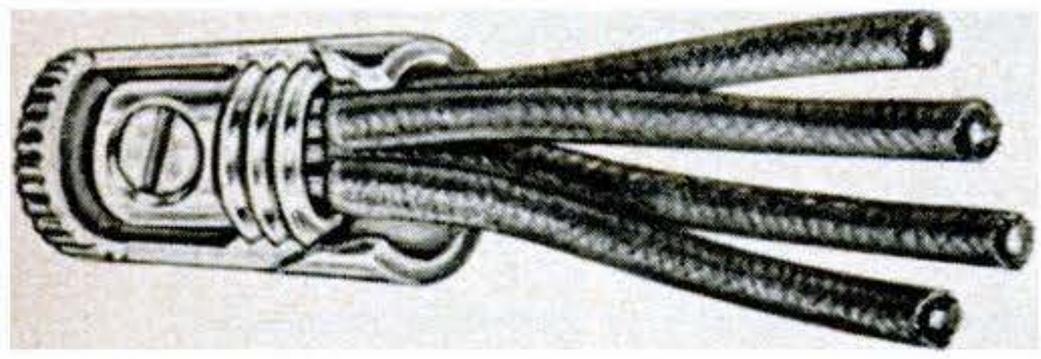
1. Slotted Workbench. Simple hold-downs secure work to this new bench for sawing, planing, sanding or routing.

Although the bench can be covered by a removable top held by locating blocks, the slots between the two-by-fours have many uses. Ripping with either a portable power saw or a handsaw (right above) is easy. The slots are handy, too, for through nailing or drilling. Also, wide pieces of work can be wedged in the slots for edge planing.

Other features of the bench include the removable plywood top (left above) to give a flat working surface. Wedged vertically in a slot, the top acts as a fence.

Power tools can be quickly attached or removed. The tools first are bolted to a wooden base. Two-by-fours spaced to match the slots are bolted to the base. Hold-downs then lock the base to the bench.

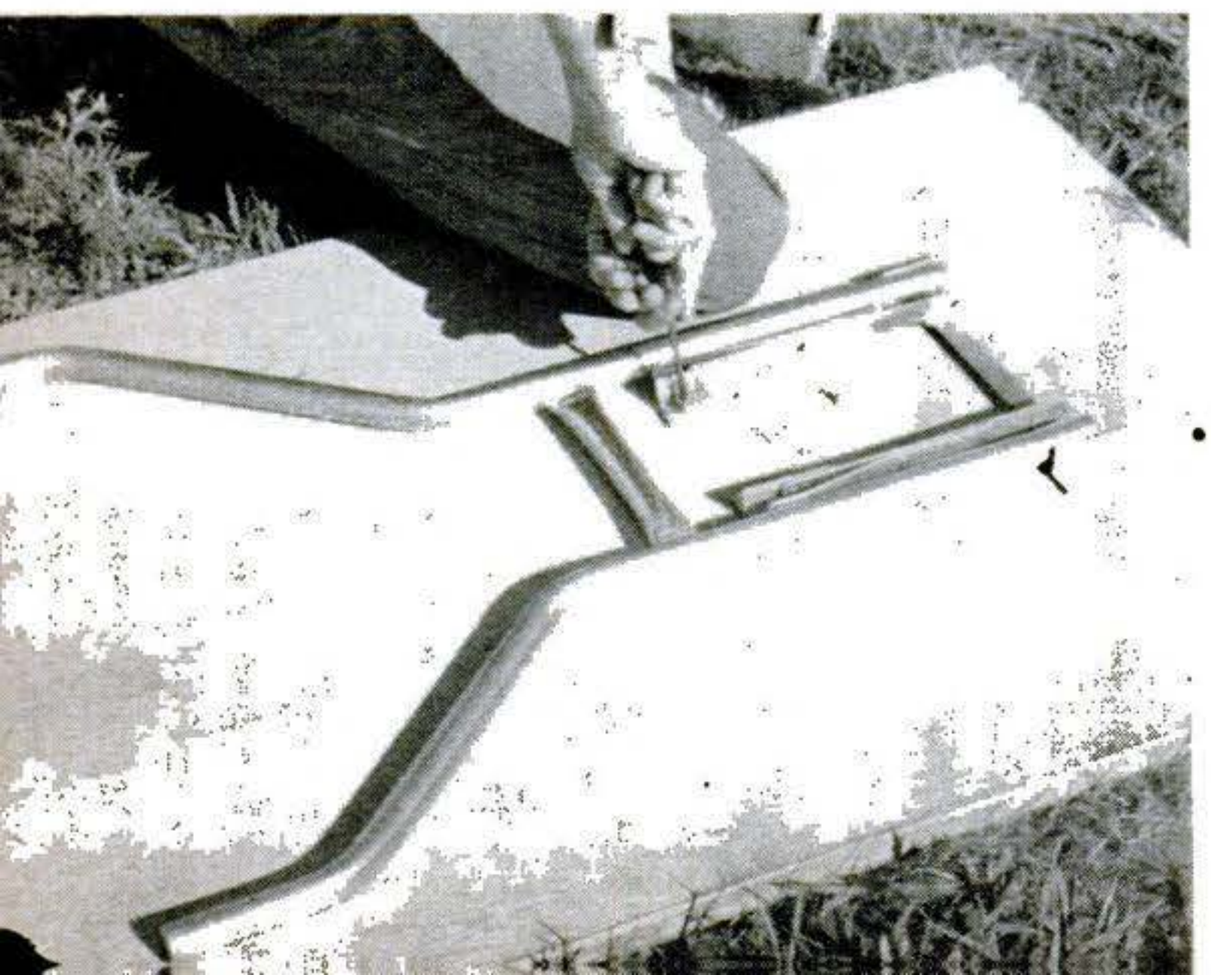
The bench, 24″ wide, 28″ high and 60″ long is assembled with bolts. Included are the removable top, two bench-top clamps, four hold-downs, wood-working vise, junction box for power tools and four wedges. It retails for about $60.

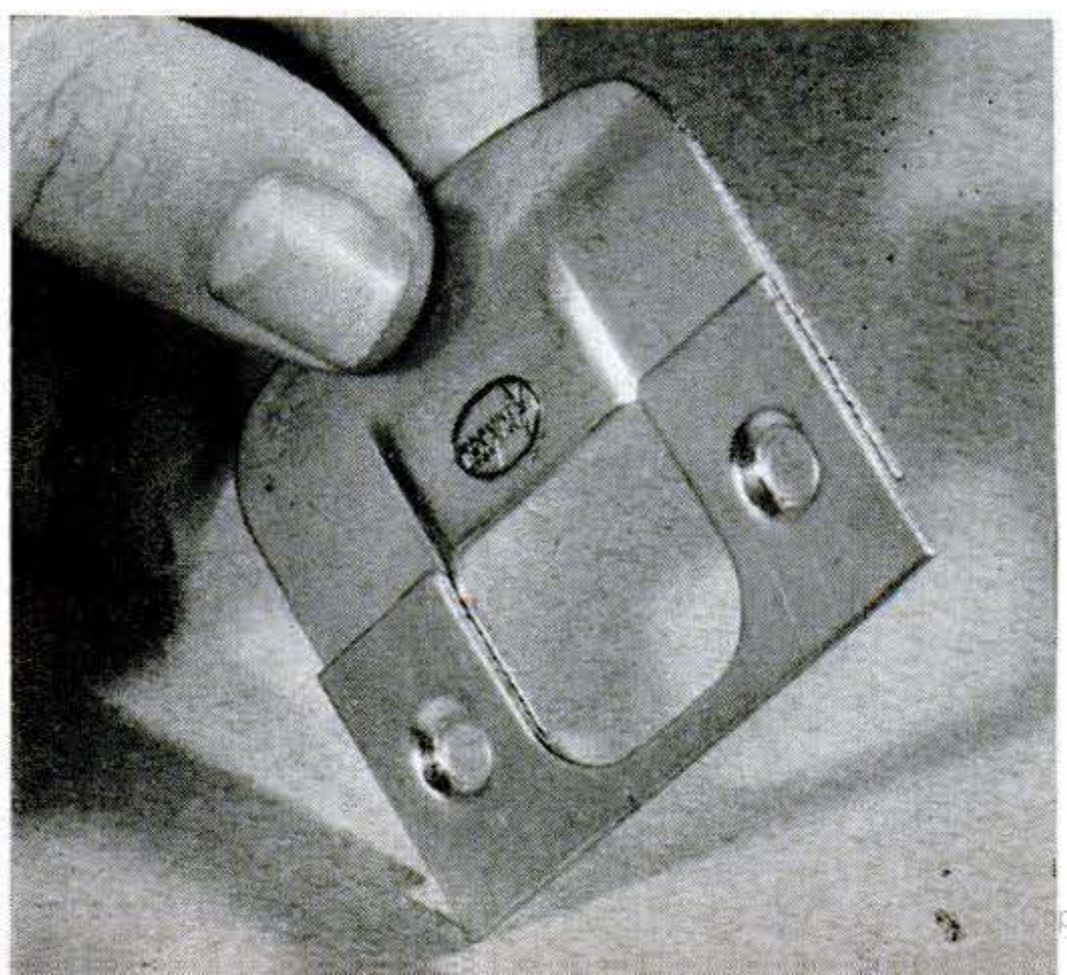


2. Setscrew Connects Wires. Two or more wires can be quickly joined with this connector (left). After the stripped wires are inserted in the brass sleeve, the setscrew is tightened, joining the wires. Then a Bakelite shell is threaded over the brass sleeve. The connector can be removed and used again to make a new connection. A screwdriver is the only tool needed.

3. Folding Table Legs. Strong enough to support more than 1,000 lb., these tubular steel legs convert a plywood panel into a general-purpose table. A flush door could be used to make a more elegant model. The screw-attached legs make a surface about 30″ high when extended, but quickly fold back to permit compact storage.

4. Door Strike Plate Adjusts. With the two screws slightly loosened, this strike plate can be moved to compensate for warping, settling, added paint layers or other causes of faulty alignment between door latch and strike plate. Serrations on facing parts hold the setting when the screws are tightened. Maximum adjustment is ⅛″.





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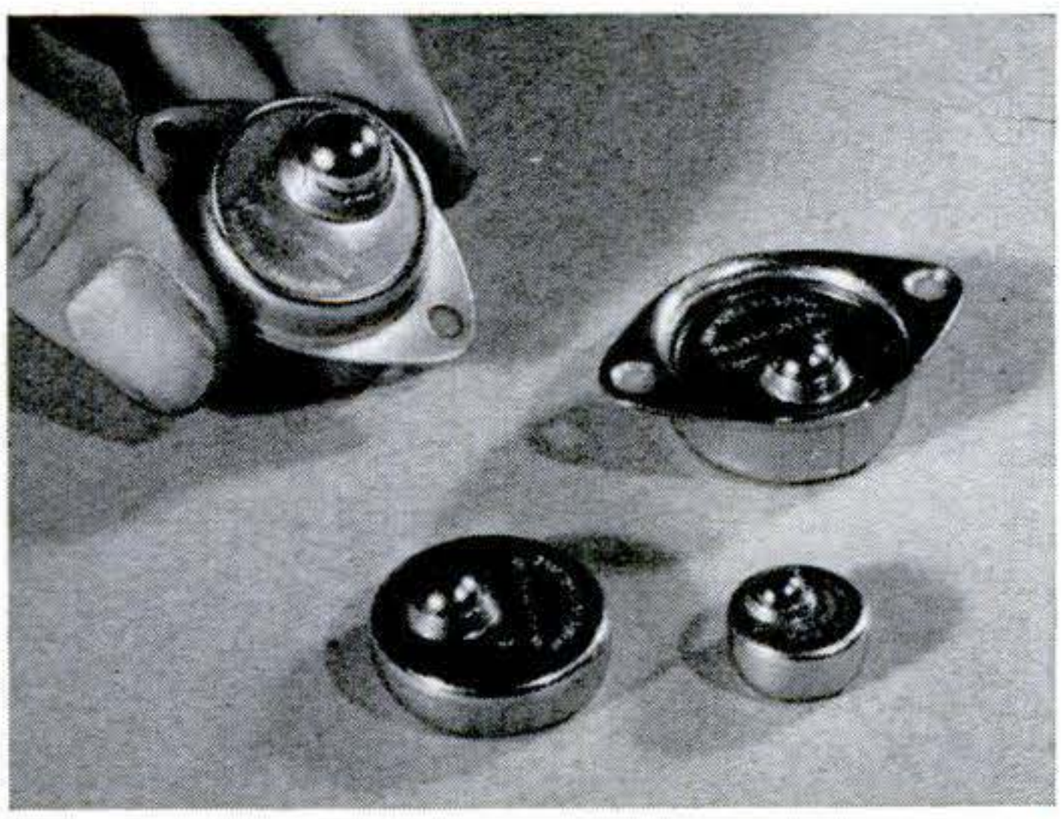
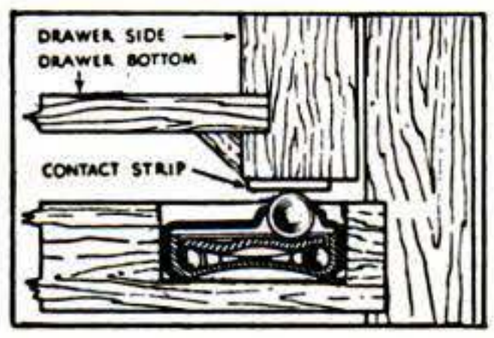
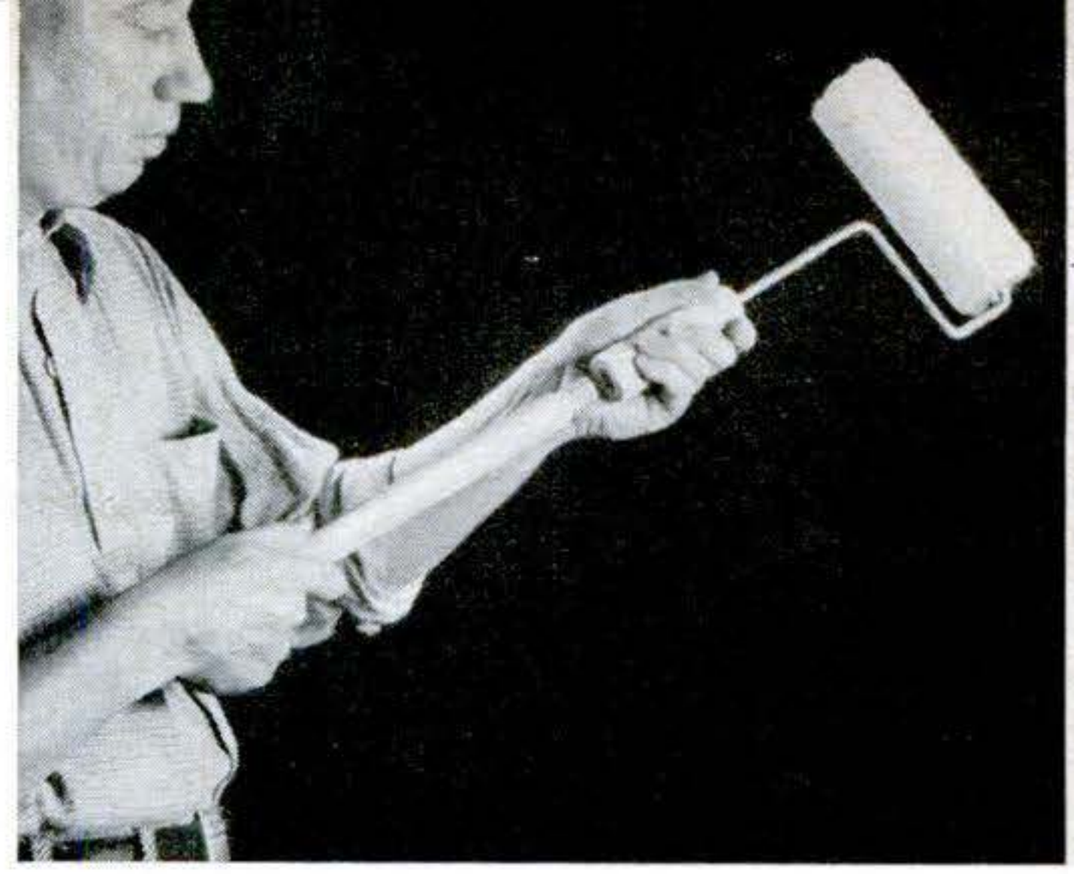
5. Box Finds Metal. Pipes, heat ducts or plastered-over electrical outlets can be located beneath plaster or wood with the Plaster-Eye. The instrument operates on self-contained dry cells, works by measuring the effect of eddy currents, and gives readings through metallic lath. When the instrument is passed over a hidden pipe, for example, the needle swings over sharply.

6. Rim Pours Paint. With this attachment (right) in place, paint won't slop over the rim when you mix or stir it, and the spout also makes it easy to pour paint. The plastic can enlarger—called Pormix—is attached by snapping it into a gallon can, keeping the can's sealing groove free of paint.



7. Ball-Bearing Glides. Drawers and sliding doors roll freely on these British-designed glides. A metal contact strip serves as a track for several circular units (above) mounted in the other member. Each circular unit has an off-center contact ball that bears on a circular plate inside. This, in turn rides on a thrust race. The glides are available with or without flanges.





8. Extension Fits Paint Roller. With a mop or carpet-sweeper handle threaded into the handle of this paint roller, you don't need a ladder or scaffold to reach ceilings and upper walls. Without the extension, the roller can be used in the ordinary manner. The roller is 7″ long.

9. Five Ladders in One. Because of notches and metal fittings, this ladder can quickly be adjusted to a number of positions. It can be used as an extension ladder, a stepladder, a stairway ladder (above) or as two straight ladders. It comes in two models—a heavy-duty job for painters and a household model. Both are available in lengths of 5′ to 8′ that extend from 8′ to 14′. The household model has flat steps on one section, making it easier for women to use as a stepladder.

Further information can be obtained from: 1. Martin Baumann Co., 370 Lexington Ave., NYC; 2. Holub Industries, Inc., Sycamore, Ill.; 3. Institutional Sales Co., 4932 Portico St., Philadelphia 44; 4. Kwikset Sales and Service Co., Anaheim, Calif.; 5. Plaster-Eye Co., 2560 Noblestown Rd., Pittsburgh 5; 6. The Pormix Corp., Glenville, Conn.; 7. Alpha Tool & Supply Co., Westwood, N. J.; 8. The American Products Co., 3311 Edson Ave., NYC; 9. Speicher Bros. Ladder Co., Indianola, Iowa.

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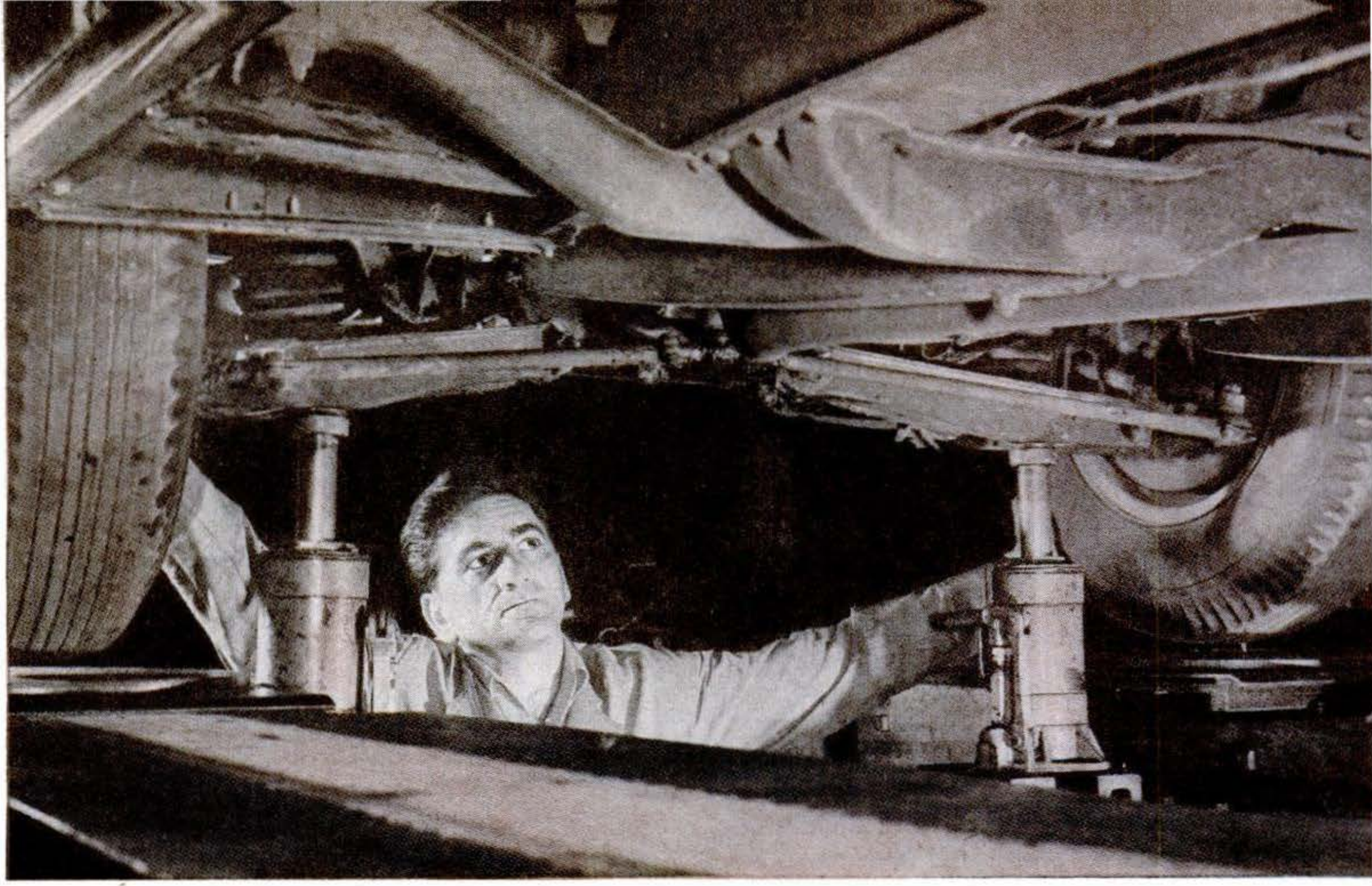

How an Expert Aligns an Auto's Front End

It takes delicate instruments and a lot of know-how to keep the wheels of modern high-speed cars rolling true and safe.

By Howard G. McEntee

WHEN old Dobbin was a colt, buggies and wagons rolled around corners with ease. But in this motorized age, you have to go to specialists like Arnold Nadworny to keep your car taking the turns properly.

Nadworny is a wheel-alignment specialist. Every working day he deals with the intricacies of caster, camber, toe-in and kingpin inclination—all part of that mathematical jungle, front-end geometry, that confuses so many apprentice mechanics.

Knowing how to make adjustments, Nadworny is convinced, is just the beginning of what a good front-end man should know. He should also know why. Nadworny has a success story to tell about that—his own.

Some years ago he was a traveling trouble shooter for a manufacturer of the type of equipment he now uses. Hit by a yen to settle down, he looked around for a likely place to establish his own shop.

The community he picked already had several alignment shops, all reasonably successful. But Nadworny knew that they had a failing in common. They could do a front-end job, but the operators had never bothered to find out the reasons for what the books told them to do. Some even used their equipment incorrectly.

It Takes More Than Fancy Gauges

Nadworny's confidence that he could get a slice of the business by doing a better job has paid off. His shop is now a leader in the community.

One thing strikes you when you take a car to Nadworny's shop—the amount of work he does, the checks he makes, before taking even one reading from those fancy gauges you associate directly with front-end

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alignment. But without this preliminary work, he explains, you never could know whether the readings you get are correct.

The first rule for aligning a front end is that the car must rest on a level surface. And the car won't rest level if tire pressure isn't equal all around.

So Nadworny, like all thorough front-end men, makes sure that incorrect tire pressure, spring sag, spring shackles, shock absorbers and bent or eccentric wheels are not causing the car to tip one way or the other. This check includes the whole car, not just the front end.

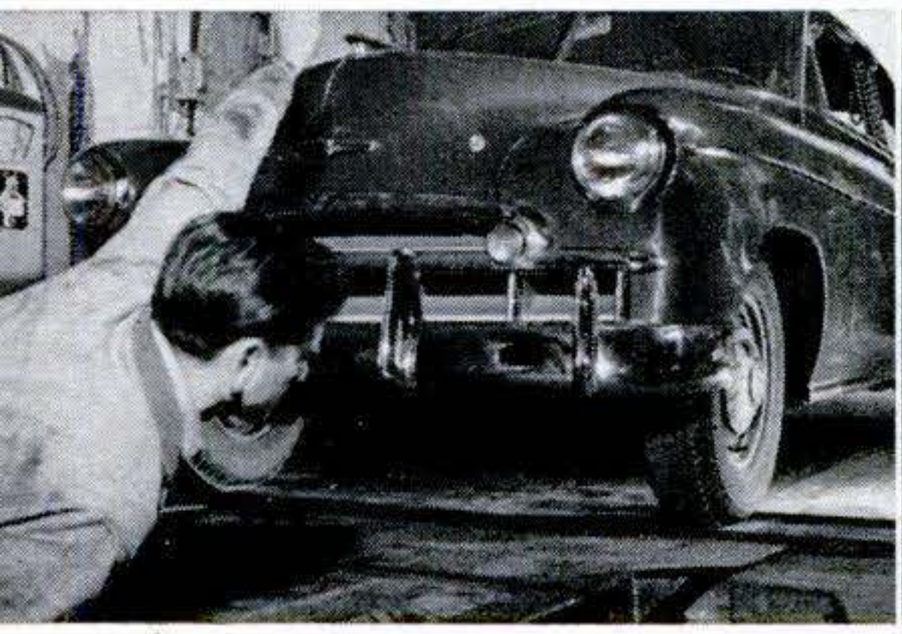
Each Maker Has Own Specifications

At the front end, checks and any necessary adjustments are made of the spindle bolts and bushings, the wheel bearings, tie-rod ends, the upper and lower support-arm pins and bushings, the lower control arms and bushings, steering arm, spindle, axle, torque and radius arms and wishbones.

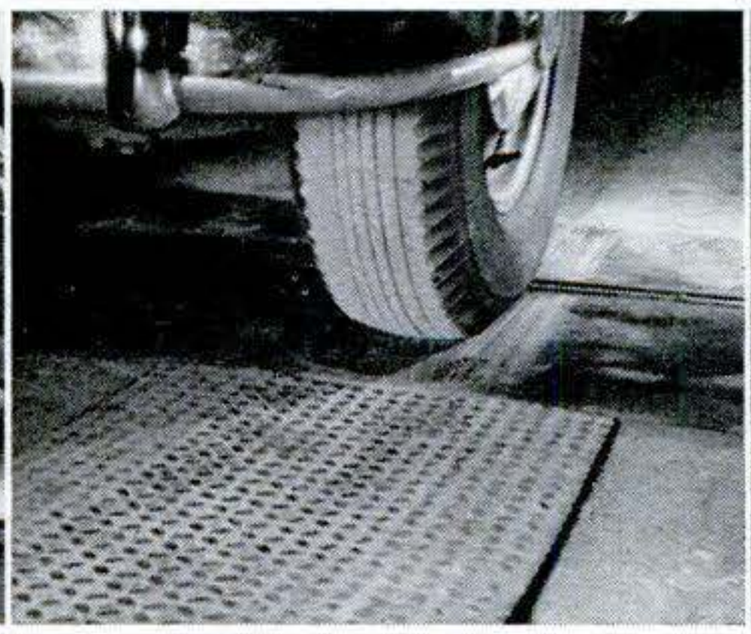
Then, finally, comes the alignment itself. Camber, caster, toe-in, kingpin inclination and toe-out on turns all are brought to specifications furnished by the car manufacturer. (To understand these confusing terms, see experiments that follow this article.)

Specifications vary considerably from car to car and year to year. Surprisingly enough, some manufacturers specify no camber and toe-in as the ideal. That has been the case with all Chrysler-made cars since around 1940, and the corporation has sought to impress on its mechanics that "front wheels straight ahead and straight up and down" is the goal to shoot at. Lately, Plymouth has also listed zero caster as the ideal specification.

In the old days, mechanics could do a pretty good job of hitting alignment angles by eye. But knee-action front ends brought complications. Today it takes specialists like Arnold Nadworny, using specialized equipment, to do the job right.



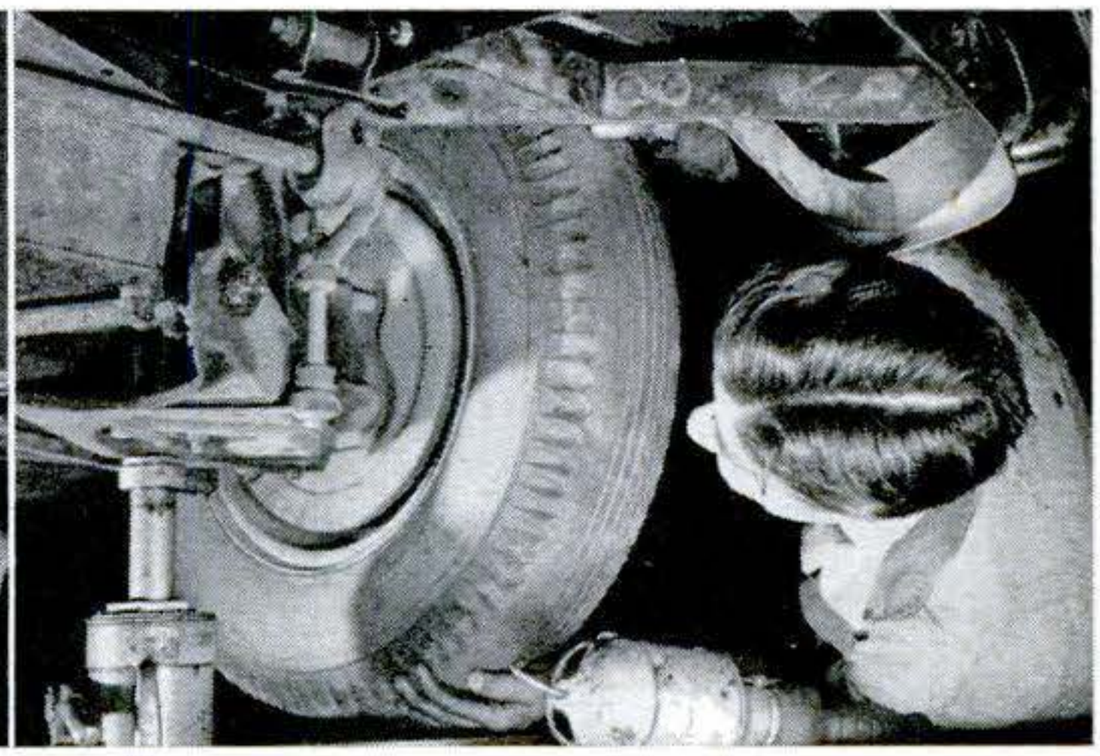
1 Beginning a job, Arnold Nadworny guides car up ramp of alignment tester. As front wheels begin to climb ramp they cross toothed bar, giving a toe-in reading on the dial at the left.



2 Toothed bar, free to move sideways, records how much tire is dragged sideways. Same toe-in measurement can be made on rack. Wear on inside treads here suggests alignment is needed.

3 Too much toe-in was one trouble, so Nadworny corrects it first thing. Toe-in is adjusted by changing length of tie rod or rods. Screw arrangement here facilitates the job.

4 Before other alignment checks, Nadworny inspects wheel bearings, repacks them and removes looseness. Early in game, pressures also are brought to same reading in all tires.



5 Jacked-up wheels are shaken vigorously to see if there is play in kingpin bushings or knee-action parts. It is rarely worthwhile to attempt wheel alignment if such parts are worn.

Please turn the page for 8 more alignment photos.

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6 **Kingpin and knee-action wear** is even easier to detect if a pry bar is used. Both wheels also are shaken to reveal play in tie rod, drag link, pitman arm and steering gear.

7 **Actual alignment checks** now begin. This gauge measures both caster and camber. For an explanation of these alignment terms, see the experiments following this article.

8 **Angles are recorded** on chart as the job progresses. Note that gauge points rest against rim edge—not on tire or wheel ring. Curved scale indicates both caster and camber.

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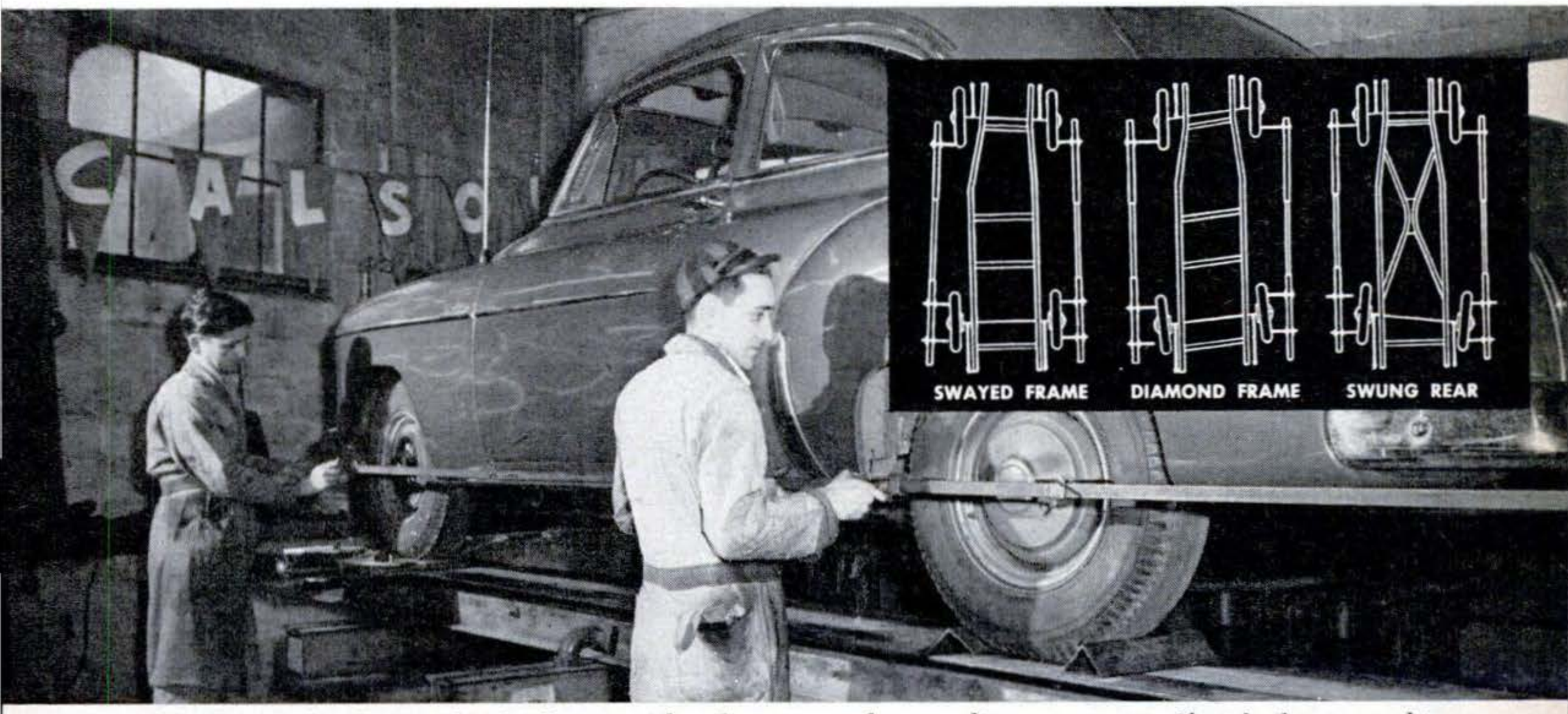
9 Camber is adjusted on this particular car by rotating eccentric upper pivot pin. It has socket for Allen wrench Nadworny is using. In this case, 180° rotation gives entire adjustment range. Same pin is threaded to move front and back to change caster.

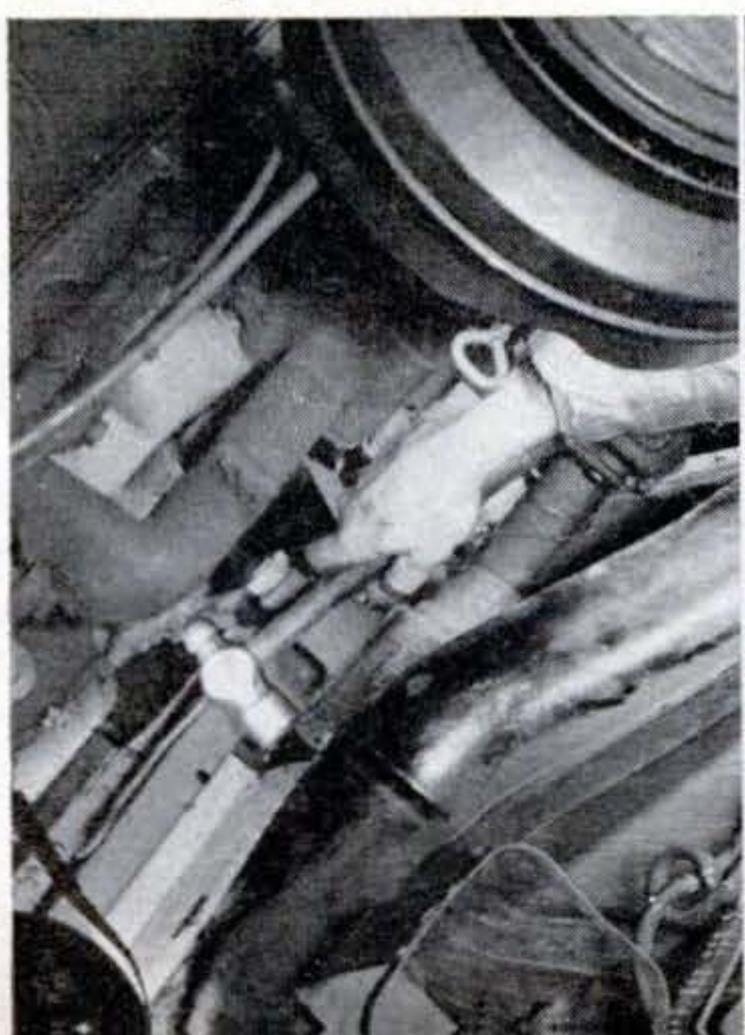
10 Hydraulic pressure from jack is used to bend knuckle for increase or decrease of camber if eccentric pin does not allow enough adjustment to give correct reading. The forged knuckle support can stand such bending without any ill effects.

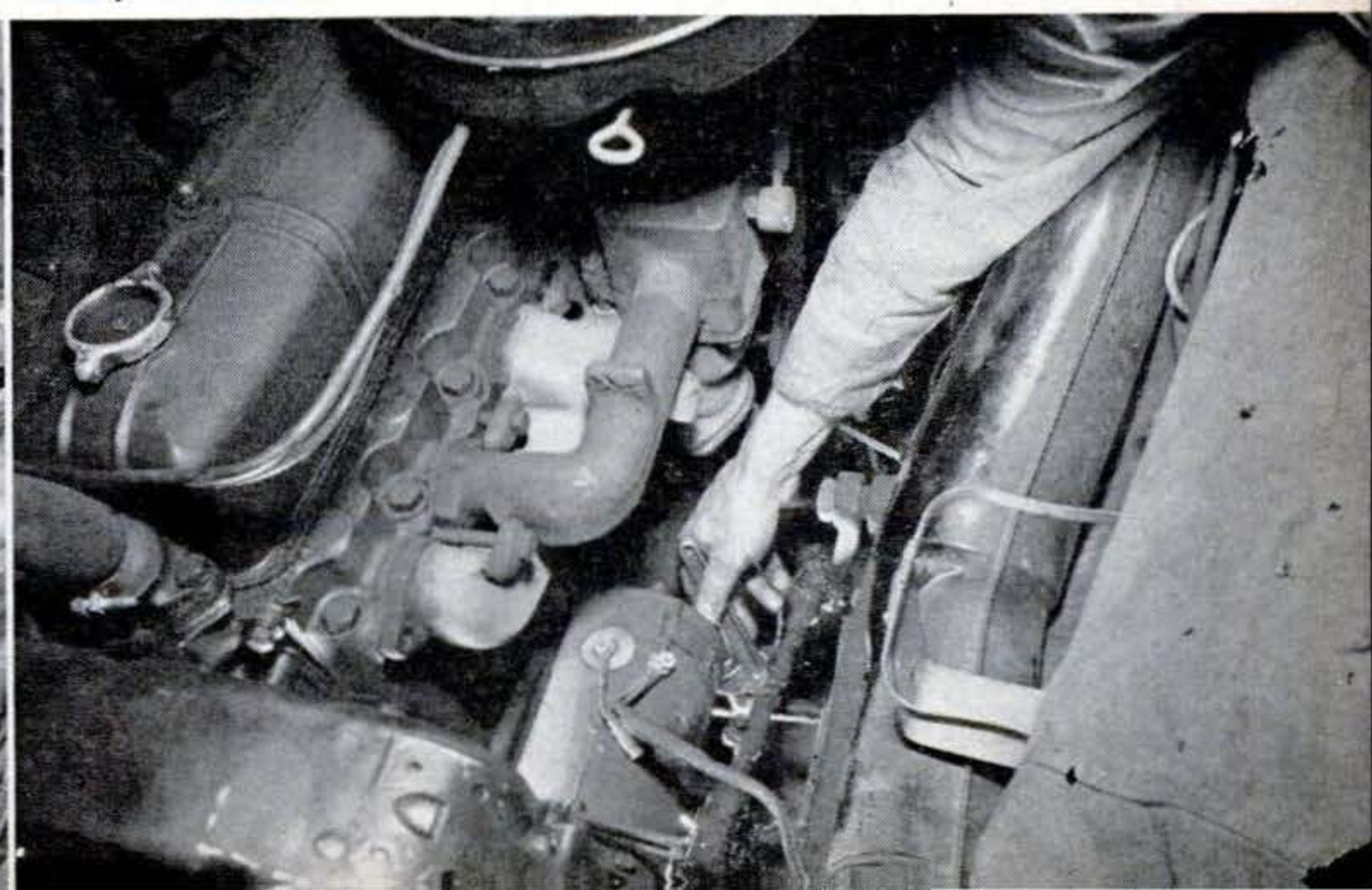


11 Rear wheels are checked, too. After front wheels are set absolutely straight ahead, tracking gauge is used on both sides of car to find whether front and back wheels are parallel and same distance apart. Sketch shows tracking defects that gauge may reveal. Tolerance of only ⅛" is allowed. Frame straightening is also a Nadworny specialty.

12 As final fine point, excess lash in the steering-gear mechanism is taken up by rotating an adjustment. This then is locked in position.

13 Drag link is adjusted to center steering wheel. With front wheels straight ahead, center bar of steering wheel should be horizontal. An uncentered wheel causes play in gearing. After a final check on alignment ramp and a road test, *this* car is ready for travel.

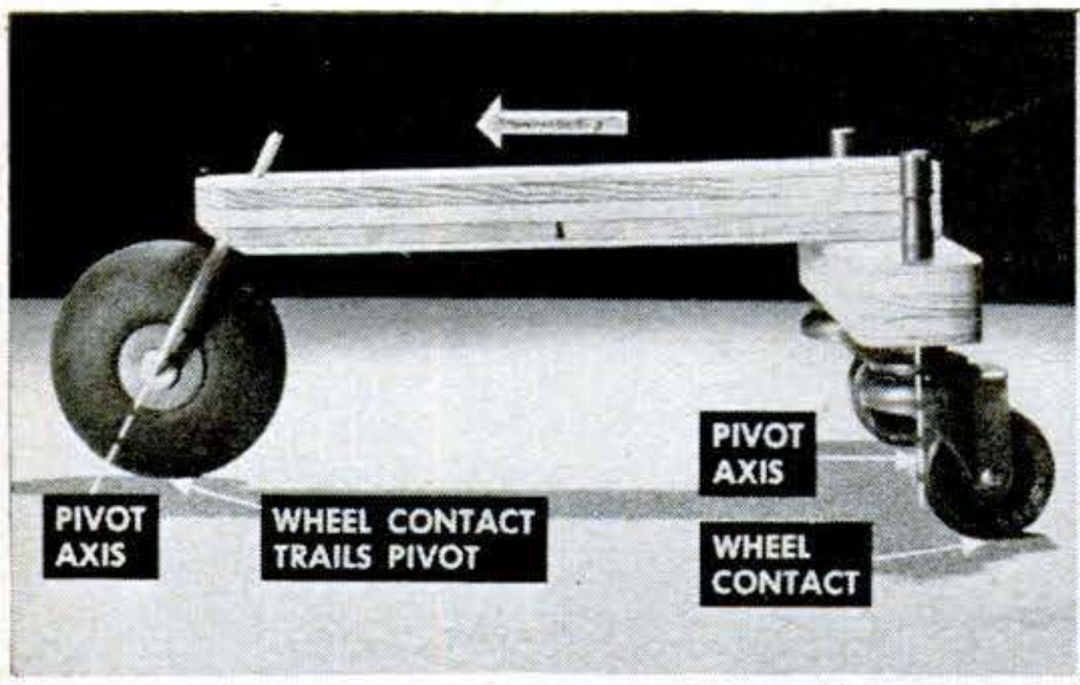


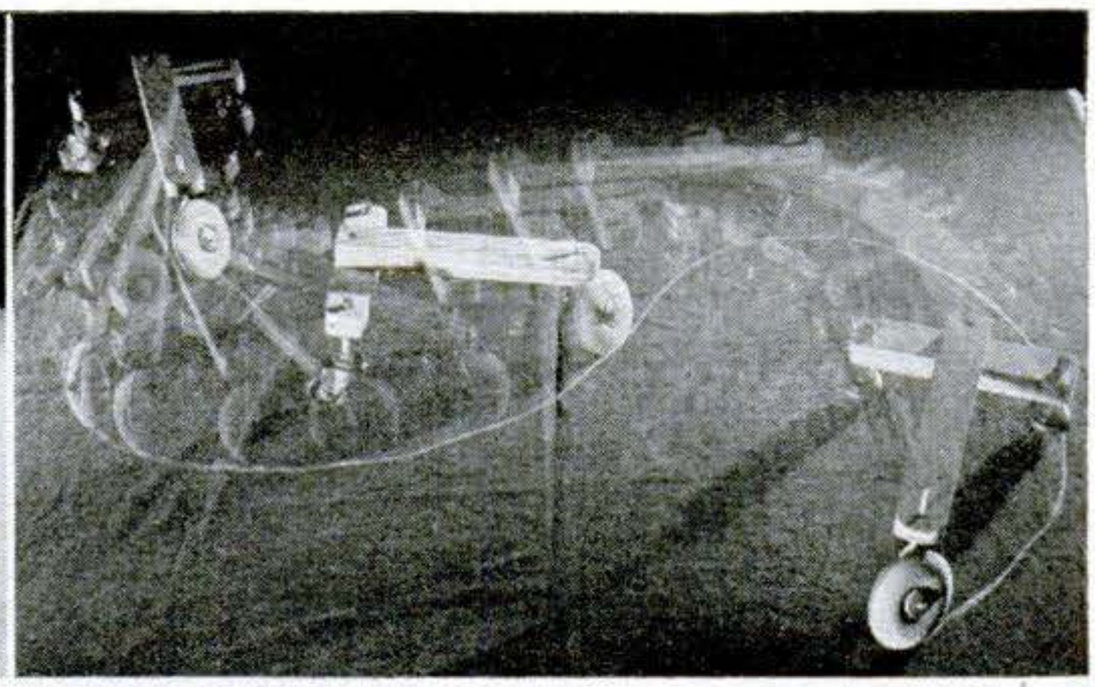


Models Show Why Car Wheels Need Alignment

By Harry Walton

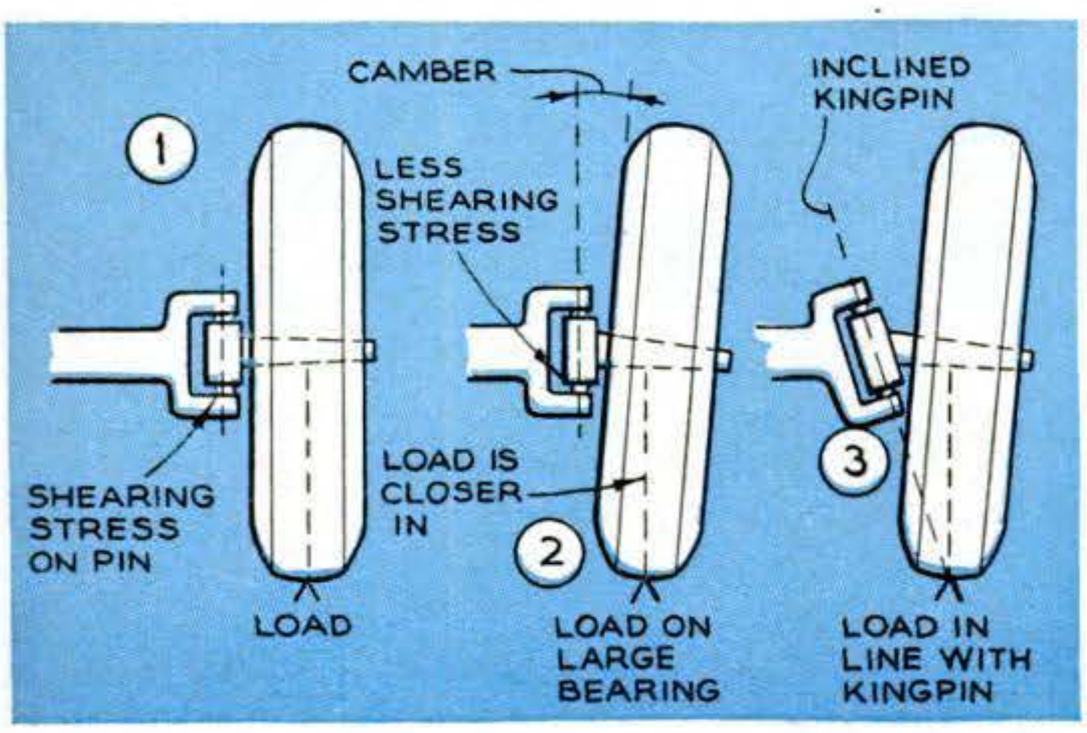
Terms like caster, camber, kingpin inclination, toe-in and toe-out are confusing until you know the reasons for these simple engineering tricks. Lots of mechanics don't.





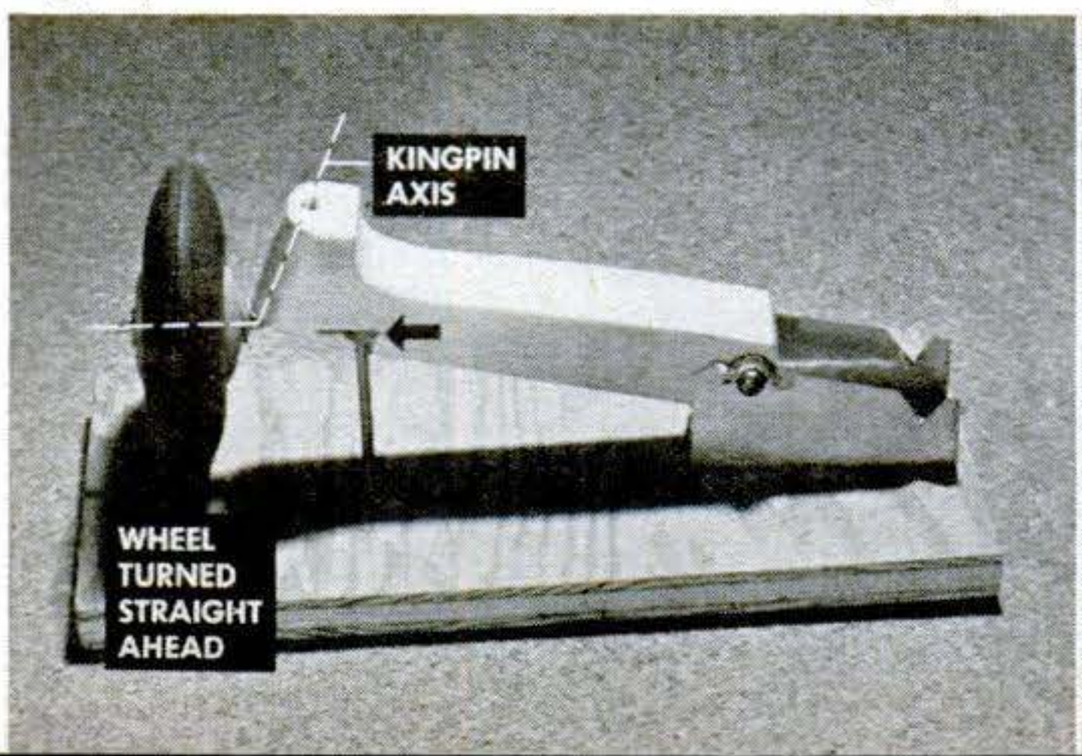
Caster. Ever try to push a piece of furniture with a reversed caster? It wabbles because the point of wheel contact is ahead of the pivot axis. But if the point of contact trails behind the pivot axis, direction is easily controlled. Front auto wheels are given caster for the same reason. In the model at left, above, the single wheel on the inclined pivot axis (kingpin) shows the method used. While it looks like a reversed version of the casters at the rear, the two are actually alike because, here again, the point of wheel contact is behind the pivot axis.

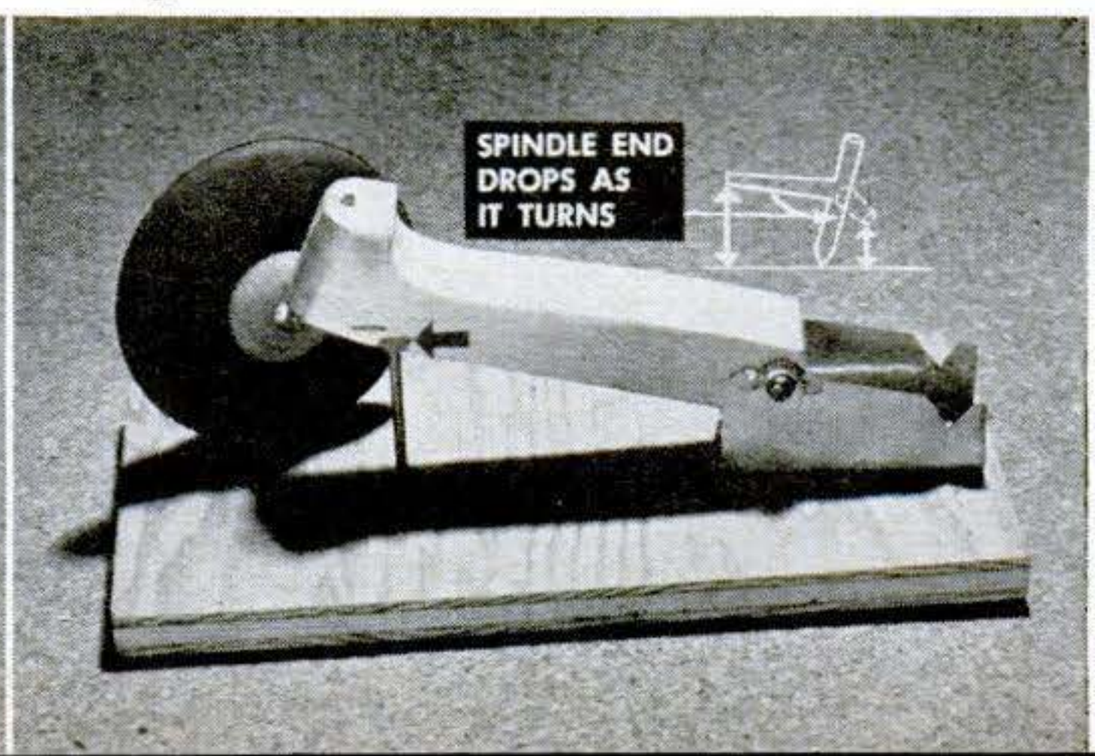
The multiple-exposure photograph at right, above, shows that both types of castered wheel will swing in whatever direction the model is being pushed.



Camber. View of a much simplified wheel, spindle and axle at left shows that the load represented by the weight of the car comes between the wheel bearings (1). This looks reasonable until you consider that this off-center thrust is constantly trying to bend up the spindle and shear the kingpin. By tilting the spindle downward slightly, the wheel leans out at the top (that's camber) and you bring the load line closer to the main bearing, giving it less leverage to shear the kingpin (2). Front-wheel brakes required longer spindles, aggravating the problem. It was met by inclining the kingpin also, so its axis meets the load line (3).

Kingpin inclination not only brings load of car in line with the kingpin axis, but also adds steering stability, making the car tend to keep a straight course and even come back to it after a turn. The mockup below shows why. With wheel straight ahead, spindle is parallel to ground (or slightly downward because of camber angle). As steering turns the spindle body, end of spindle tends to swing down farther. Since it can't push the wheel into the ground, it raises the car. Pencil mark (arrow) shows how the axle rises as the wheel is turned from straight-ahead position. The weight of the car seeks to turn wheel back straight.





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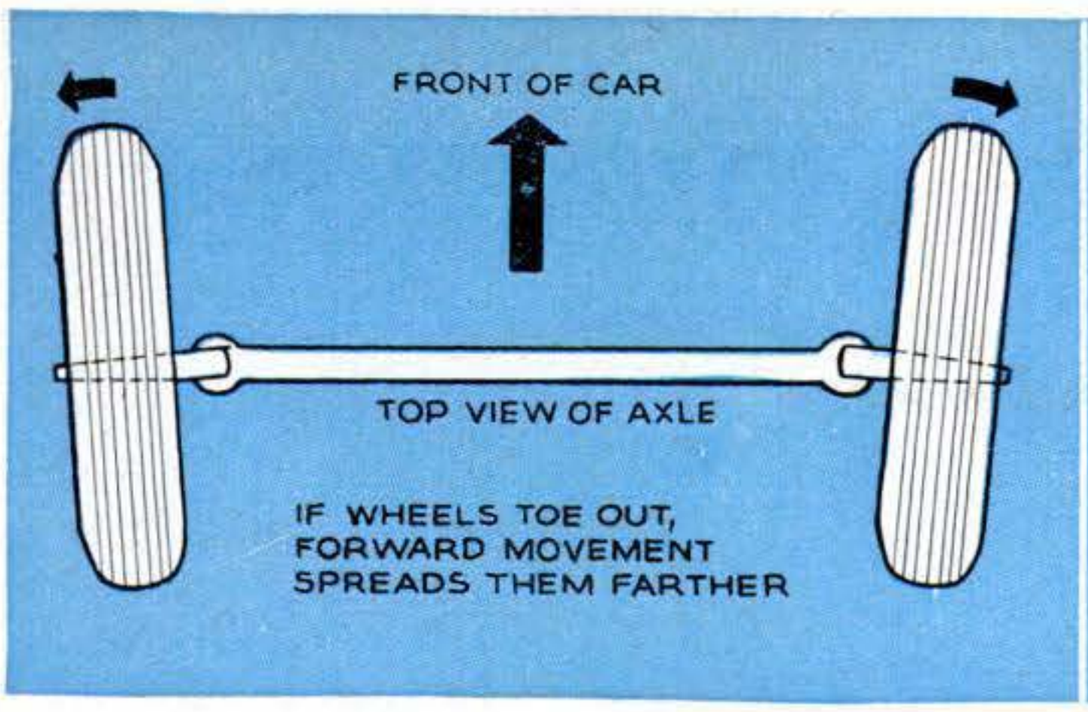
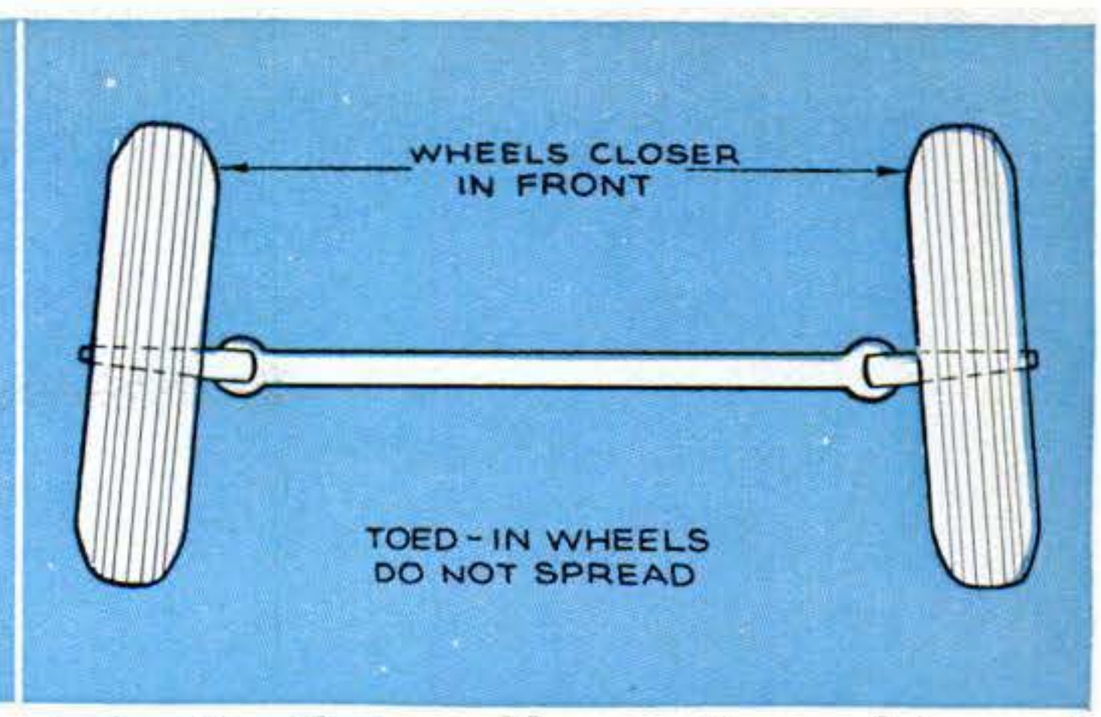
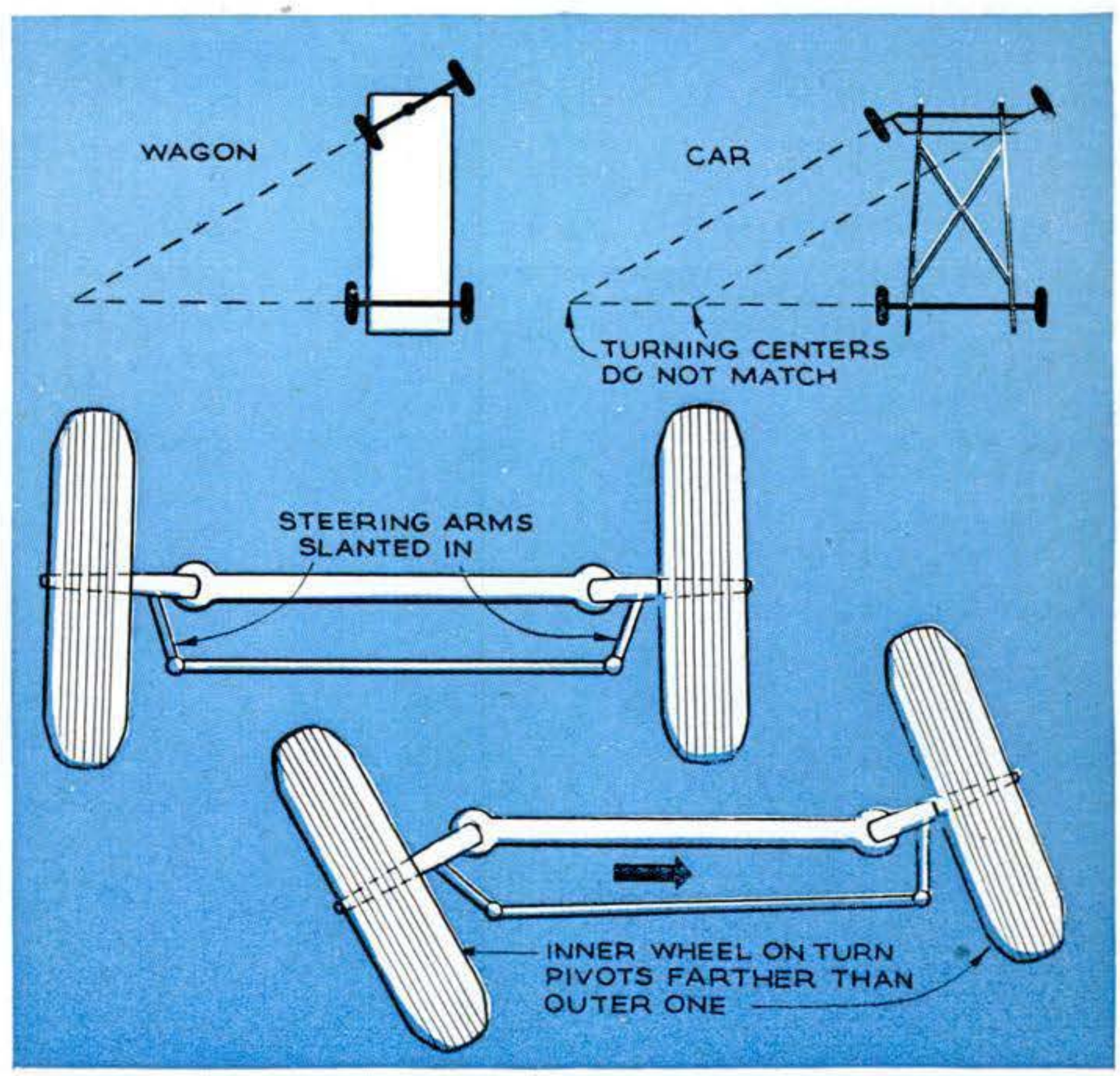
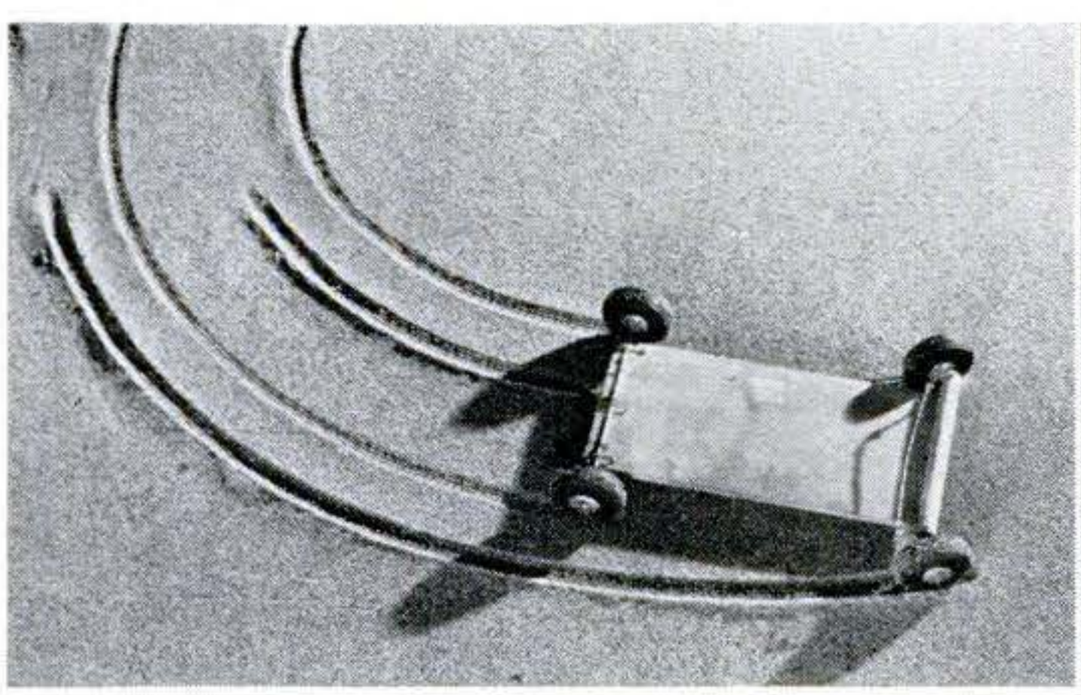


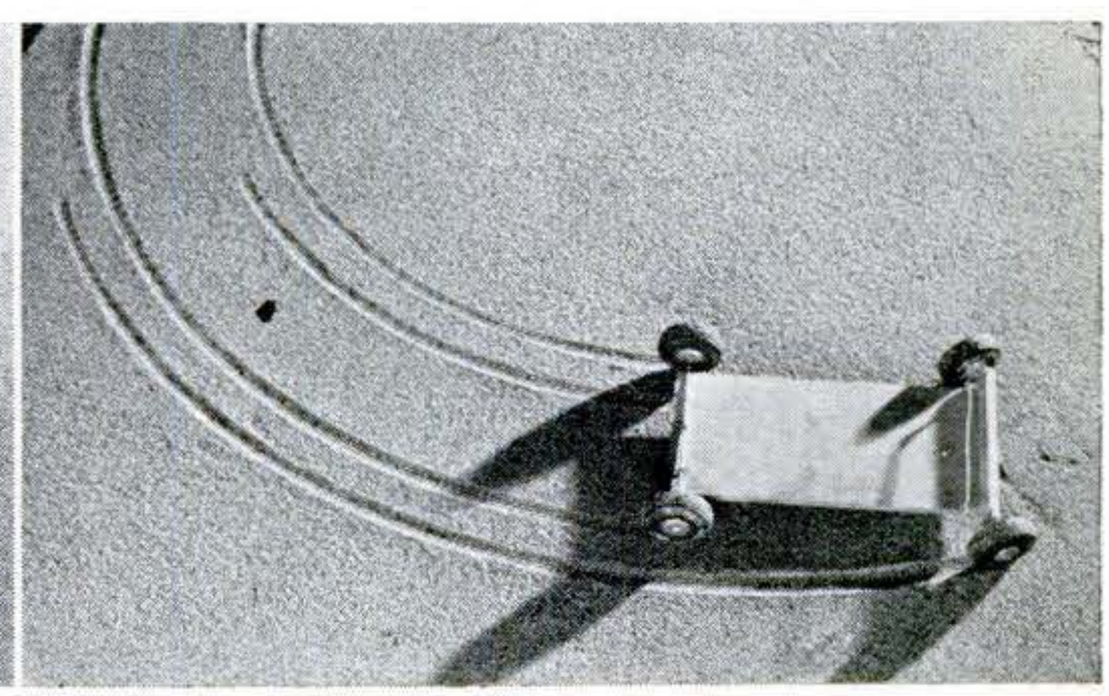


Toe-in. If front wheels swung on their kingpins without a tie rod between them, you can easily imagine how they would both fold back when the axle was pushed forward. Even with the tie rod, tendency would remain, increased by braking action that would wear tires and transmit every road shock directly to the tie rod. Toeing in the wheels slightly while they are pointing straight ahead counteracts their natural tendency to spread apart.

Toe-out. In buggy days, the pivoted front axle and the fixed rear one swung around a common turning point. But when front wheels were independently pivoted on a rigid axle, swinging both equally gave them a different turning radius, only one of which could be the same as that of the rear wheels. The inside front wheel has to be turned farther than the outside one to have the same turning center. Faced with the problem of having toe-in with wheels straight and toe-out when in a turn, engineers solved it by slanting the steering arms. Move both equally, and the inner one swings farther from the straight-ahead position.







Why tires wear if front wheels don't turn on the same center is shown by sand tracks of a four-wheeled model (left). Rear wheels make sharp clear tracks. Front wheels (in this case with *excessive* toe-out) throw up a ridge of sand. Battling each other, they are being dragged sidewise in their own tracks. With proper toe-out, front wheels make tracks as sharp as rear ones (right), proving they are not being subjected to any sidewise thrust.

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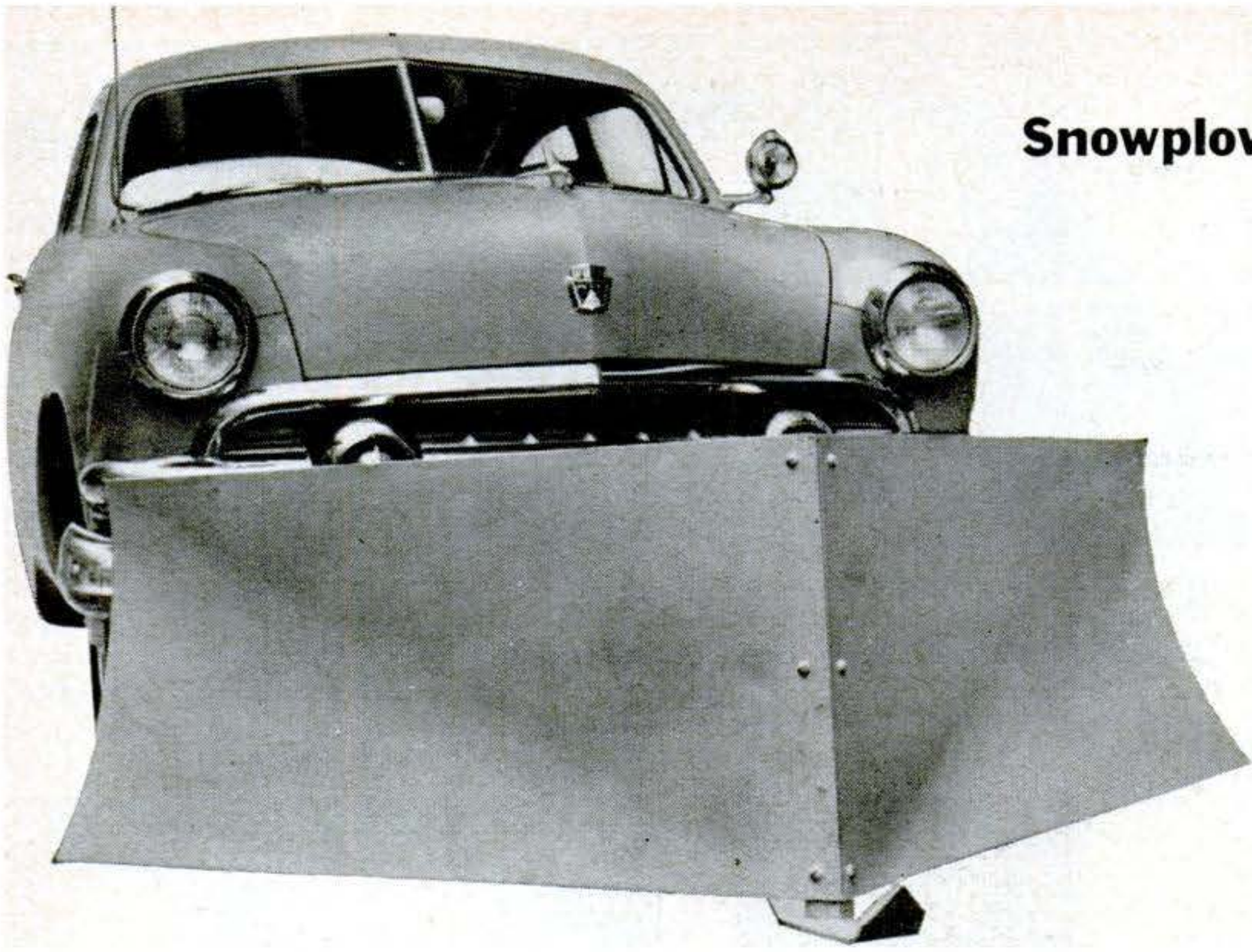


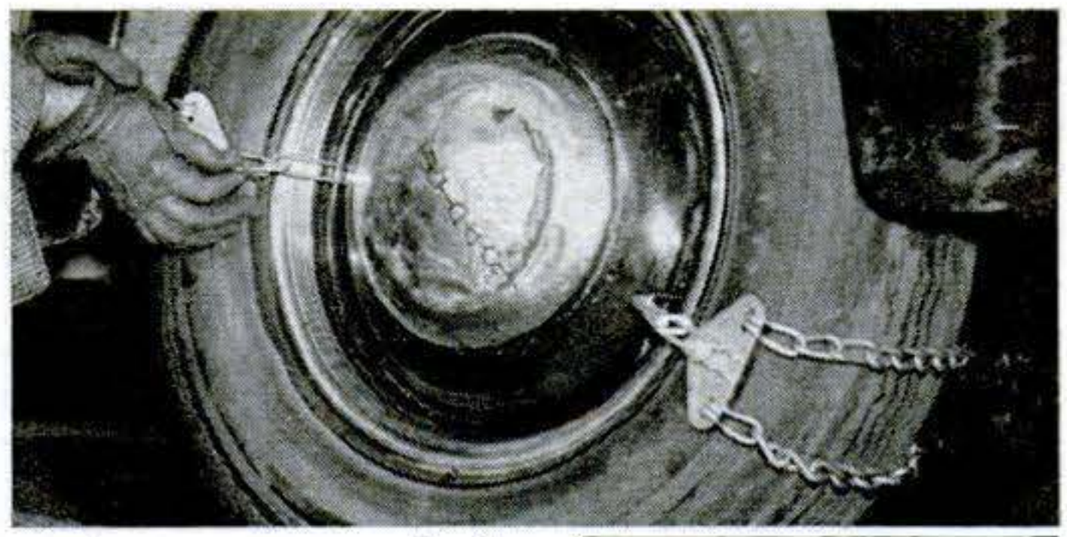
Snowplow Hitches to Car

WHEN snow piles up in the driveway, you can hitch this plow to the bumper of the family car and quickly clear it away. The plow attaches in a few minutes if you keep the ball members of two trailer hitches permanently mounted on the bumper during the winter. Blades are ⅛″ steel. *Cheston L. Eshelman Co., 119 Light St., Baltimore.*

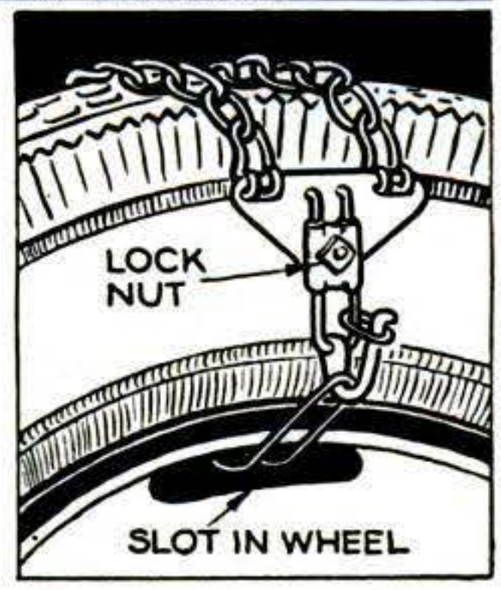
Liquid Toughens Brake Lining

BRUSHED on the brake linings, a new liquid compound of copper and silver is intended to eliminate fading and lengthen the lining life. Used at the Indianapolis Race last year, Cop-Sil-Loy is available for passenger-car use. *Abbott Kible Co., 11001 W. Santa Monica Blvd., West Los Angeles.*

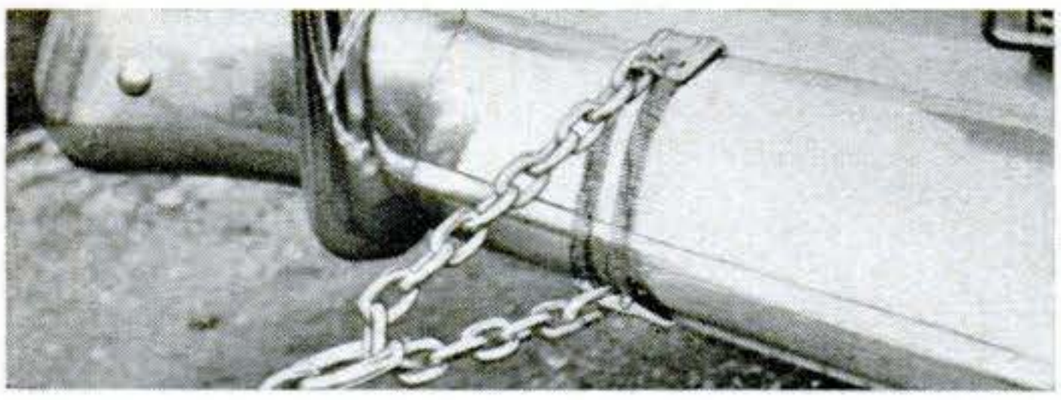
All-Steel Chains Lock on Wheel



A METAL ring locks these emergency chains on the wheel. Two sizes adjust to fit all cars with wheel slots. Lock nuts make the size adjustment. *Kon-veen-yunt Chain Co., 1406 Cherokee Rd., Richmond, Va.*

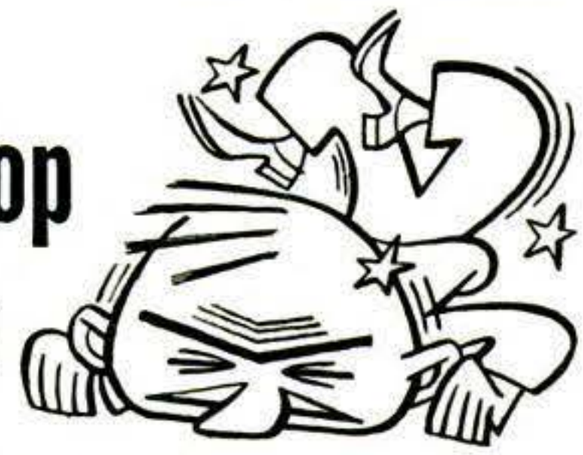


Springs Keep Tow Chain Snug



EIGHT feet long and weighing only 5½ pounds, this tow chain can be fitted to the bumper of any car. Strong coil springs hold the clamp securely to the bumper regardless of its width. *Master Specialty Co., 3016 E. Lake St., Minneapolis.*

Workshop Wisdom



Bill's brakes didn't hold worth an atom.
Relined is what he shoulda had 'em.
But instead, with a thrill,
He went down a steep hill
And for brakes used his chin on macadam.

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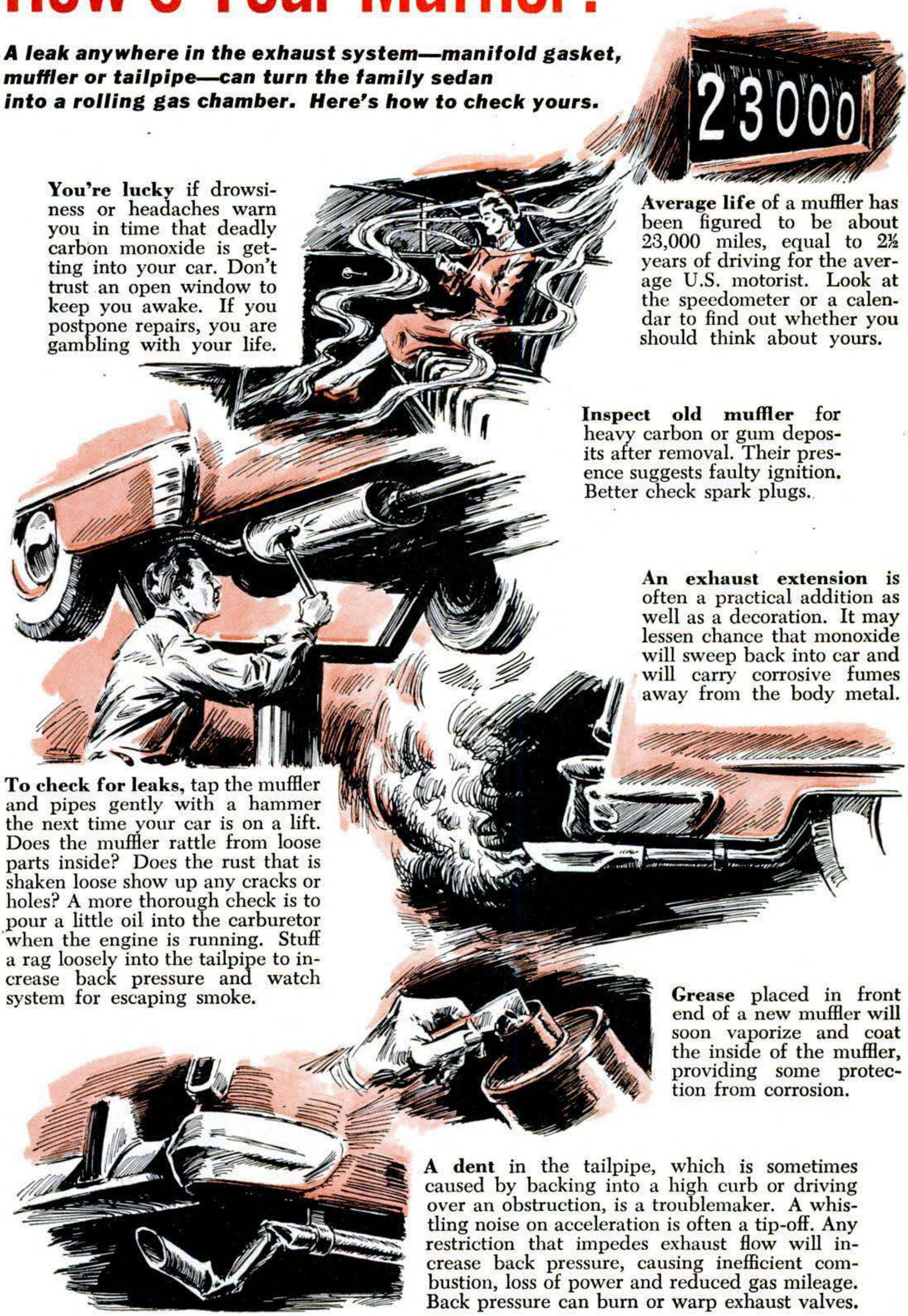
How's Your Muffler?

A leak anywhere in the exhaust system—manifold gasket, muffler or tailpipe—can turn the family sedan into a rolling gas chamber. Here's how to check yours.



You're lucky if drowsiness or headaches warn you in time that deadly carbon monoxide is getting into your car. Don't trust an open window to keep you awake. If you postpone repairs, you are gambling with your life.

Average life of a muffler has been figured to be about 23,000 miles, equal to 2½ years of driving for the average U.S. motorist. Look at the speedometer or a calendar to find out whether you should think about yours.

Inspect old muffler for heavy carbon or gum deposits after removal. Their presence suggests faulty ignition. Better check spark plugs.

An exhaust extension is often a practical addition as well as a decoration. It may lessen chance that monoxide will sweep back into car and will carry corrosive fumes away from the body metal.

To check for leaks, tap the muffler and pipes gently with a hammer the next time your car is on a lift. Does the muffler rattle from loose parts inside? Does the rust that is shaken loose show up any cracks or holes? A more thorough check is to pour a little oil into the carburetor when the engine is running. Stuff a rag loosely into the tailpipe to increase back pressure and watch system for escaping smoke.

Grease placed in front end of a new muffler will soon vaporize and coat the inside of the muffler, providing some protection from corrosion.

A dent in the tailpipe, which is sometimes caused by backing into a high curb or driving over an obstruction, is a troublemaker. A whistling noise on acceleration is often a tip-off. Any restriction that impedes exhaust flow will increase back pressure, causing inefficient combustion, loss of power and reduced gas mileage. Back pressure can burn or warp exhaust valves.

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Gus Fixes Their Wagon

Of course he could have refused to touch a getaway car—but that was no grease gun in his back.

By Martin Bunn

IT WAS nearly closing time at the Model Garage and Gus was played out. It had been a raw, windy day, he'd had to go out on several emergency calls and now he was hurrying to finish up the last job before quitting time. But he was finding it a bit difficult to concentrate with his attention divided three ways.

First, he was working on Doc Tandy's Model A. Second, the doc himself stood at Gus's elbow expounding an elaborate theory about how humans and automobiles were pretty much the same because they both broke down and had to be repaired. Third—and this was what Gus was really concerned about—an old but big, black sedan had been parked across the street for the last half-hour with two strangers in it who seemed to be keeping a mighty sharp eye on the doorway of the Model Garage.

Gus Gets the Jitters

It was just his imagination, Gus decided. Gloomy weather and fatigue had upset his nerves. He finished tightening the cylinder head on the Ford, twisted in a new set of plugs and closed the hood.

"Okay, Doc, she's all yours."

Doc Tandy gave him a keen glance as he left. "Gus, you better go home and get some rest."

Gus peeled off his dungarees. He figured he'd leave the sweeping up to his helper, Stan Hicks, who had borrowed Gus's car and would return it to the garage later in the evening. Gus looked around at the next few days' work—two overhauls and a ring job. Then he flicked off the lights and reached to pull down the doors. . .

"We got a car for you to fix." The voice slammed across his shoulder. Gus jumped.

"I'm sorry, I'm closed for the night."

"Inside, grease ape!"

Two Customers in a Hurry

Gus drew back when a pistol barrel gouged his ribs. A sneer twisted the pasty face, and piggish eyes glittered back at him. The man made a motion with his other arm, and the black sedan rolled into the darkness of the garage.

"It's simple, buster. Fix our car fast and you'll be okay. Don't, and I separate you at the belt line."

"There's all-night garages in town, and you don't need a gun to get service. If you're after my day's receipts, they're in the bank already!"

The other man stepped from the car. He was younger, neater, but there was an odd slant to his face. He spoke quietly.

"Our apologies, dear sir, but sometimes a gun is necessary. Perhaps I should explain. In criminal nomenclature we are known as escaped cons. A good friend of ours provided this car, but it doesn't run well." He

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Gus struggled with the rope, but it was no use. The cons had done too good a job.

looked around at the three dismantled cars on the floor. "And really, with no other car here in running condition, you offer us no choice but to insist that you fix ours. By the way, don't underestimate my associate's willingness to shoot. One more would make no difference. A prison guard suffered a slight case of trigger mortis last night!"

The young man chuckled over his joke.

"I could call the police."

"You'd never reach the phone."

The convict's smile broadened.

"And shooting me won't get your car fixed!"

"No, but there are other places, and you don't want to die."

Gus looked from one man to the other. They weren't bluffing.

"Okay. You win."

"Now you're getting smart. Here's the pitch. This heap sputters every time you step on the gas in low gear, and in high over 35 or 40 it misses badly."

"That isn't so serious."

"It's serious if we have to play tag with a few patrol cars. Get busy."

Gus stepped away from the prod of the gun and opened the hood. It was a 1940 Lincoln Zephyr. He plugged in the trouble light and started the engine. It idled smoothly and sounded in good shape for its age. But, when Gus pulled on the accelerator arm and revved the engine, it sputtered erratically and backfired.

Gus rolled up his sleeves. The pug still held the gun on him.

"I'm not going to try anything. Why don't you put that thing away?"

"Because I don't want to get belted with a wrench, that's why! Just do your work there."

Gus tackled the carburetor first, on the assumption that it was out of adjustment or clogged by dirt. But it was wasted motion.

"I guess it's your ignition system."

"You guess! Look, you find it quick! We ain't got all night!"

Gus tried the plugs next. It took time to inspect 12 on the testing machine. And while he checked, he heard them whispering rapidly in back of him. Only one word reached his ears—Chicago.

Gus put the plugs back in, and as he tightened up the last one on the forward end of the engine, he remembered something. There was a certain peculiarity to the '40 Zephyr that might . . . but there wasn't time for that yet. Gus wiped the clammy sweat off his face.

"Work!" The older man waved his gun toward the engine.

The distributor points were clean. They were pitted, but not enough to cause trouble, and though they were getting old, the contact metal wearing thin, they checked out all right when he tested the setting.

Gus didn't waste time putting an instrument on the coil. Instead, he got a new one and hooked it up. Looking hopefully at his captors, Gus slowly rolled up engine speed. Just at the instant he thought the danger point had been passed the spitting began again.

Gus leaned on the car and tried to stop trembling. His mind searched frantically for an answer, but it was hard to think with a gun pointed at him.

"Shake it up!"

"Look," Gus exploded, "you might as well get it into your pin-size brain that this may take a while!"

The older man edged forward menacingly, but the other stopped him.

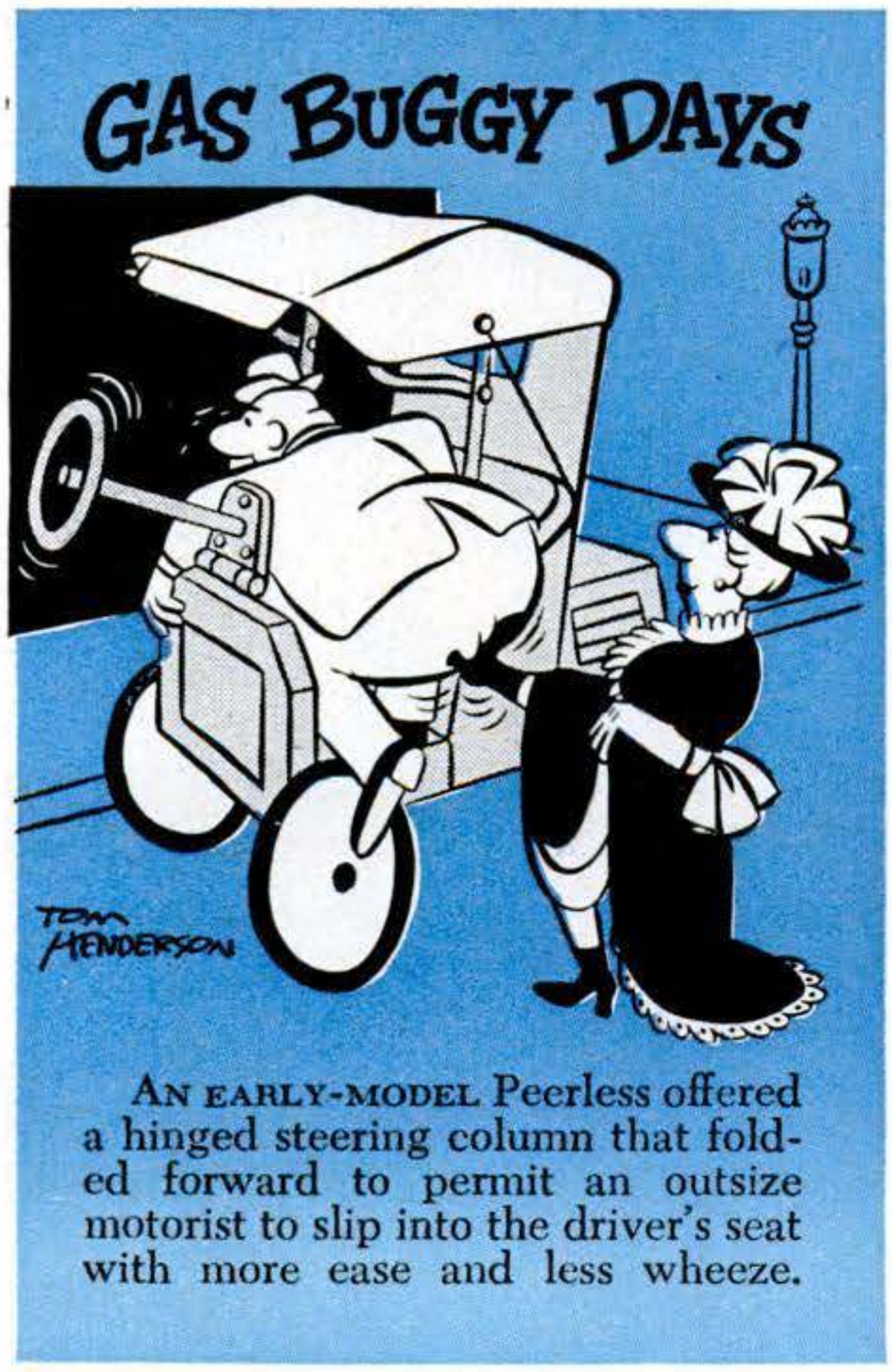
"Let him think."

Gus remembered the condenser then. There again, rather than take time to check it, he installed a new one. As a second thought he checked the insulation on the wiring, and still found nothing.

The end of the road had been reached now. He had checked everything he could without tearing the engine down.

"I've gone as far as I can. You better find another mechanic."

[Continued on page 256]



AN EARLY-MODEL Peerless offered a hinged steering column that folded forward to permit an outsize motorist to slip into the driver's seat with more ease and less wheeze.

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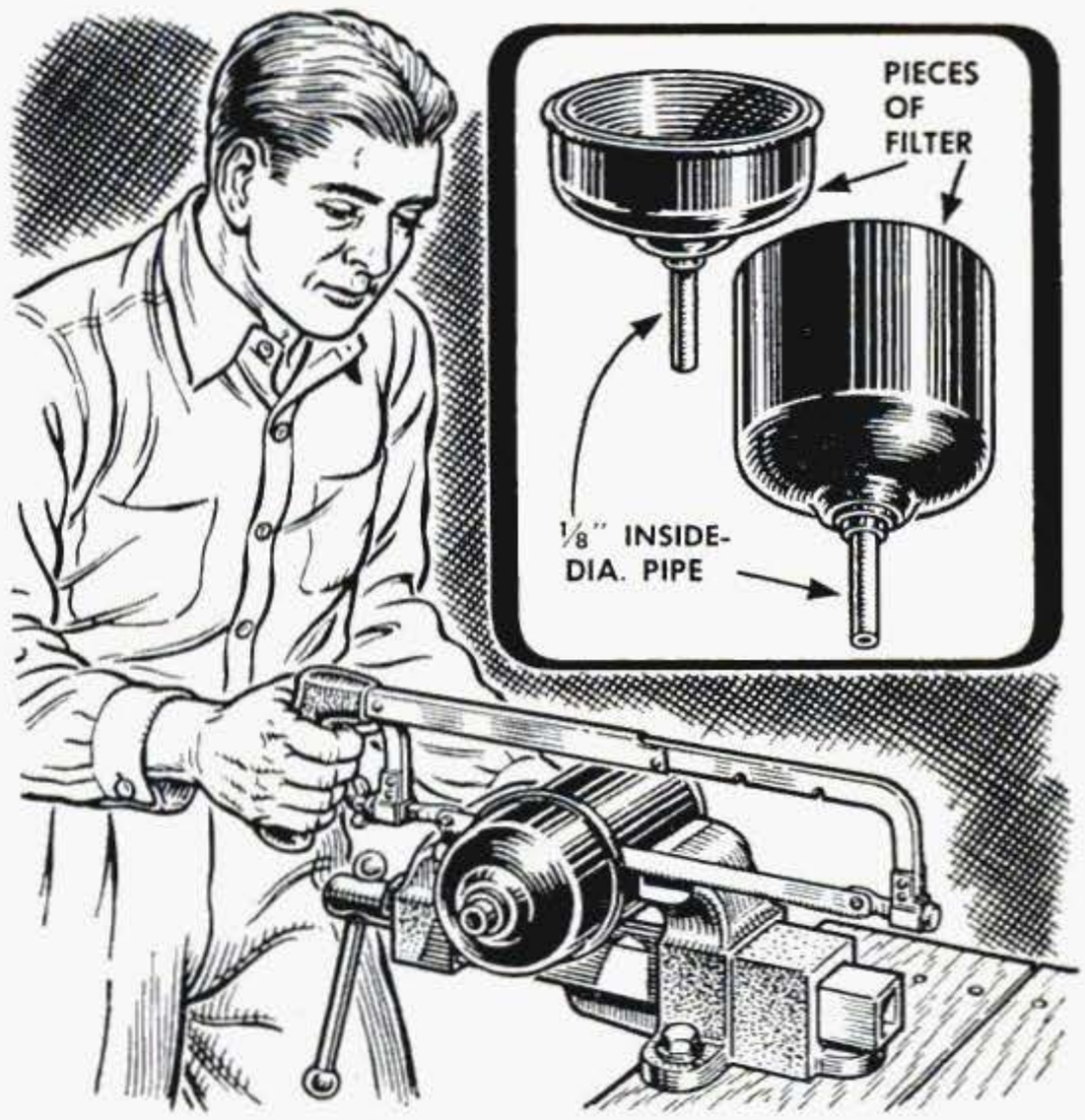
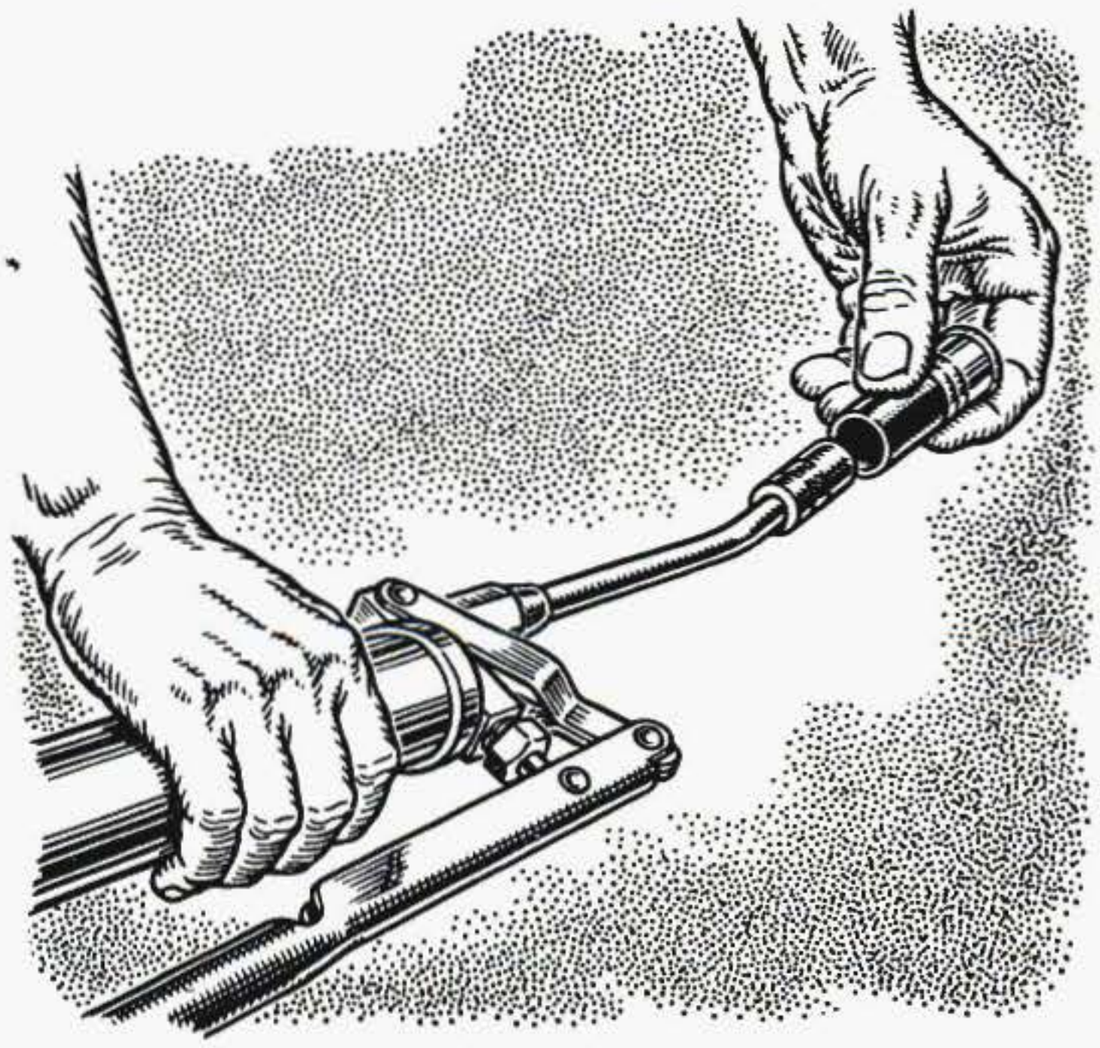
Hints FROM THE MODEL GARAGE

Paper wrapping can be removed by dropping a new tire so that it lands on the tread. The casing will flex and snap the paper. Don't use a knife; it may slip and damage the tire. Be sure that no bits of paper get inside, because they can cause tube failure.



Two handy funnels for shop use can be made by sawing in two a throwaway type of oil filter. Remove the inside element. Thread two short pieces of 1/8" pipe, screw them into the already threaded holes in each half, and the funnels are complete.

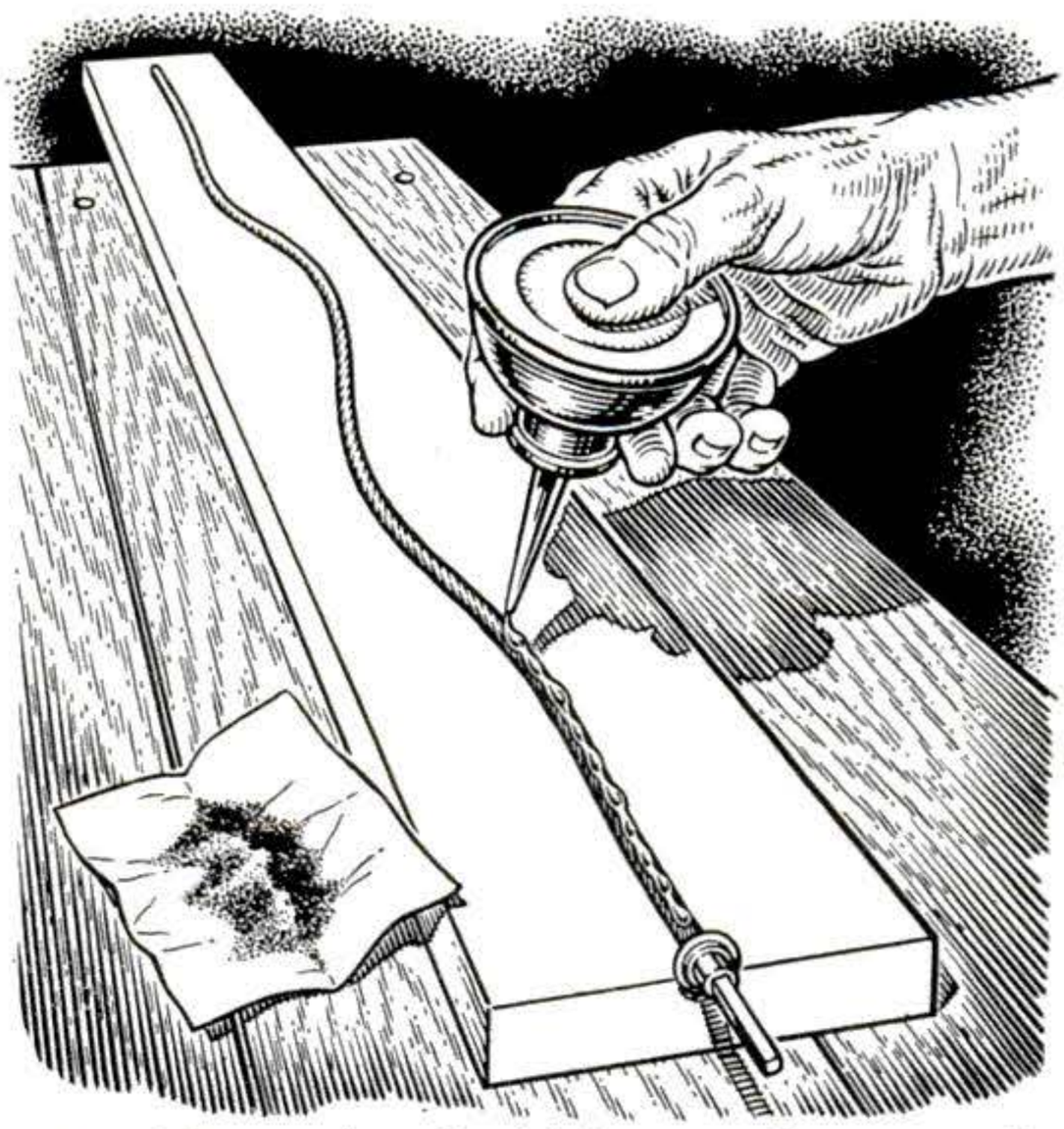


A used shotgun shell slipped over the nozzle of a grease gun will protect the coupling and keep out dirt. Dust and dirt that collect in the lubricant are sometimes driven into the grease fitting. A 12-gauge shell fits the nozzle snugly.

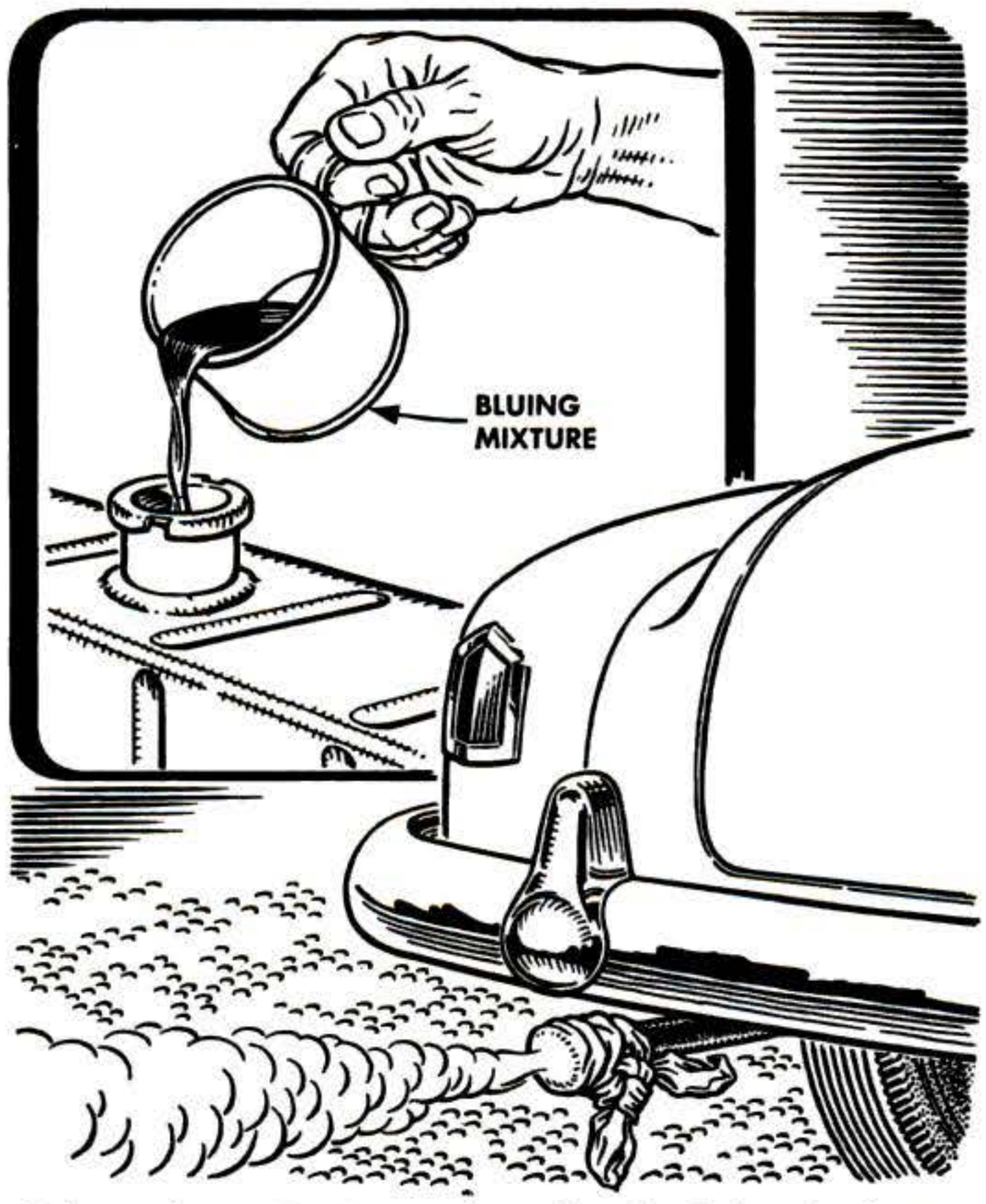
If water drips from the rain troughs and seeps into the trunk, you can divert most of it by simply closing the trough ends and drilling small holes an inch or so toward the front of the car. Close the troughs with solder or by squeezing them shut.

Please turn the page for more auto hints.

MORE Hints from the Model Garage

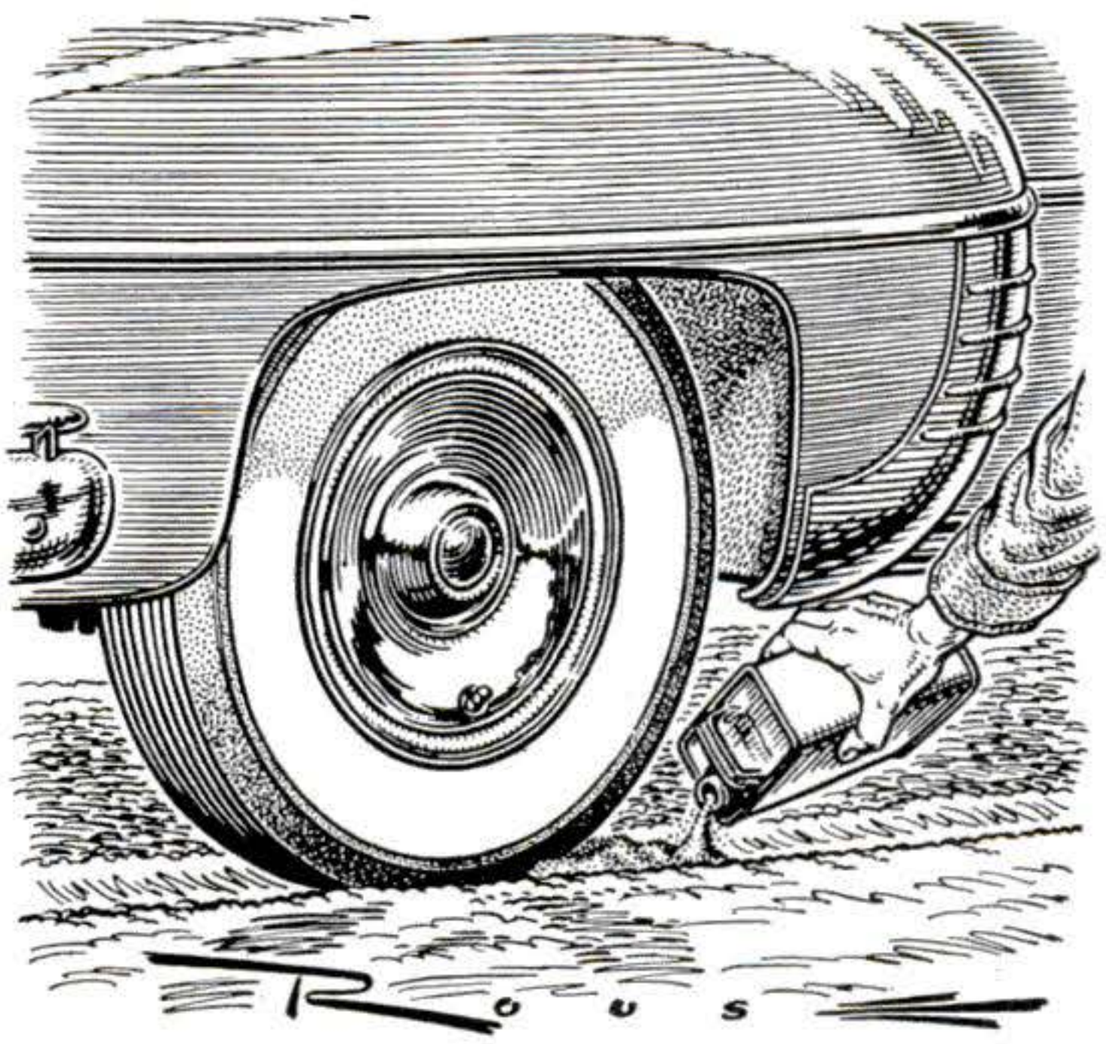


Graphite is the ideal lubricant for a speedometer cable, but getting it into the cable sheathing may be a problem. Here's one way of doing it: remove the inner cable, lay it on a board, apply the thinnest possible line of light oil on it, spray powdered graphite on the oil until the oil is blotted up and replace the inner cable.



A head gasket can be checked for leakage by adding two spoonfuls of washing bluing to a cup of permanent antifreeze, pouring it into the radiator, tying a cloth over the tailpipe and running the engine. If there's a leak the bluing will color the cloth. The antifreeze will help you in locating the leaky trouble spot.

Windshield fog and steam can be wiped away quickly with a cellulose sponge. It will remove dirt and grease streaks and absorb considerable moisture before becoming saturated. A small inexpensive sponge will do the trick.



If sand is carried in a couple of one-gallon, screw-top cans, you can simply pour it under the tires when you get stuck on ice or snow. No need for a shovel to spread it. The cans are better than a box, for the sand can't scatter through the trunk.

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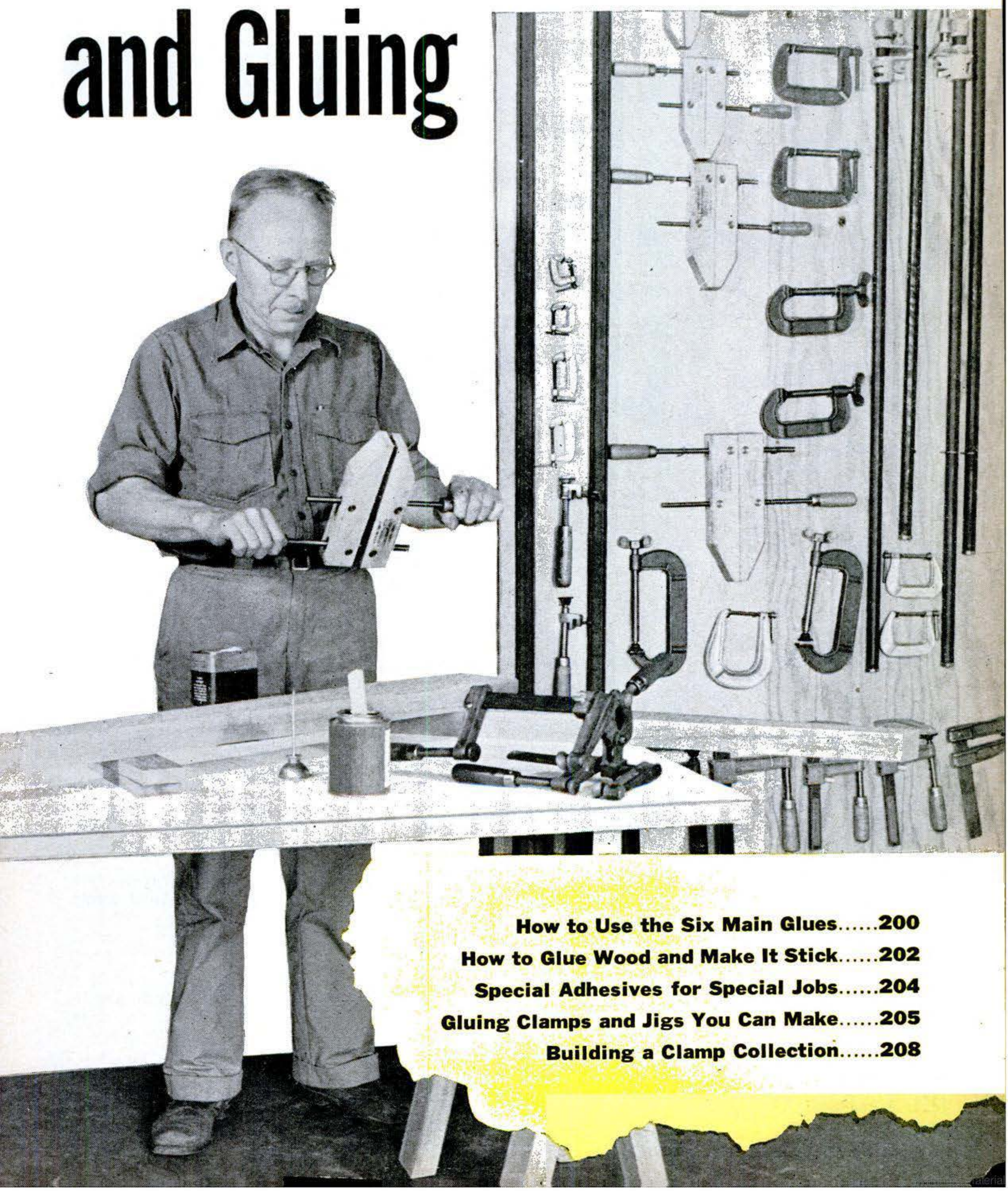
Here's how to pick the glue to suit your work and shop, how to apply it, and how to use clamps to make it stick.

All About Glues and Gluing

By Paul Corey and Darrell Huff



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Gluing Clamps and Jigs You Can Make.....205
Building a Clamp Collection.....208

THE fellow whose slogan is "hit on a good thing and stick with it" is going at gluing the hard way. No *one* glue is *the* glue for every job.

In your everyday workshop operations you may not need every glue in the book, but you will need several—possibly three or four. It pays to know which glue is good for what job so that you can choose wisely.

To complicate matters, two identical jobs using the same wood, the same kind of joint and the same clamps will require a different glue if one workshop is warm and the other chilly. The owner of the warm shop can take full advantage of the plastic resin and resorcinol glues (they set quickest and strong-

This master chart shows the six main kinds

Type Glue Liquid Animal and Fish Glue	***Type Glue*** Powdered Casein	***Type Glue*** Resorcinol
Brands include Le Page, Franklin, Rogers.	*Brands include Casco.*	*Brands include Cascophen.*
Good for Furniture and cabinetwork, general wood gluing.	***Good for*** General woodworking, especially oily woods; teak, yew, lemon.	***Good for*** Outdoor furniture, boats, items that may be soaked.
Not Good for Outdoor furniture or anything exposed to dampness.	***Not Good for*** Acid woods unless staining is not important; outdoor furniture.	***Not Good for*** Work done where temperature is below 70°.
Advantages Strong, easy to use, light color, fills cracks and gaps in joints, resists heat, mold.	***Advantages*** Strong, fairly water resistant, works in cool locations, fills poor joints.	***Advantages*** Very strong, waterproof, works well with poor joints.
Disadvantages Not water resistant, must be warmed if used in cold location.	***Disadvantages*** Must be mixed 15 min. before using, subject to mold, stains dark woods.	***Disadvantages*** Powder and catalyst must be carefully mixed, has dark color.

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est in warm surroundings), while the poor guy in the unheated garage *must* use a casein glue.

Add to this the problems of gluing oily woods (teak, lemonwood, yew and other oily tropical woods) or poorly fitted joints, and you'll find that one glue will glue all of the jobs some of the time and some of the jobs all of the time, but never all of the jobs all of the time.

For a speaking acquaintance with all of the glues used for woodworking, study the chart below. With it as your guide you can select the glues that fit your work and your workshop. Brands shown are typical of each type of glue.

of glue and where they are used best.

Type Glue White Polyvinyl	***Type Glue*** Plastic Resin	***Type Glue*** Flake Animal
Brands include Cascorez, Wilhold.	*Brands include Weldwood, Cascamite.*	*Brands include Craftsman.*
Good for Model work, paper, leather, small wood assemblies, mending.	***Good for*** Furniture, veneering, work exposed to dampness.	***Good for*** Quantity woodworking, furniture.
Not Good for Anything requiring resistance to stress and water.	***Not Good for*** Oily woods or poorly fitted joints not clamped.	***Not Good for*** Anything that may be used or stored in damp places.
Advantages Always ready to use at any temperature, nonstaining.	***Advantages*** Very strong, waterproof, leaves light-colored joint.	***Advantages*** Light-colored joints that need no bleaching, fills cracks and gaps in joint.
Disadvantages Has high cold-flow after setting. Good only for light work.	***Disadvantages*** Must be mixed for each use, needs heavy clamp pressure.	***Disadvantages*** Inconvenient for quick or occasional use, must be kept hot.

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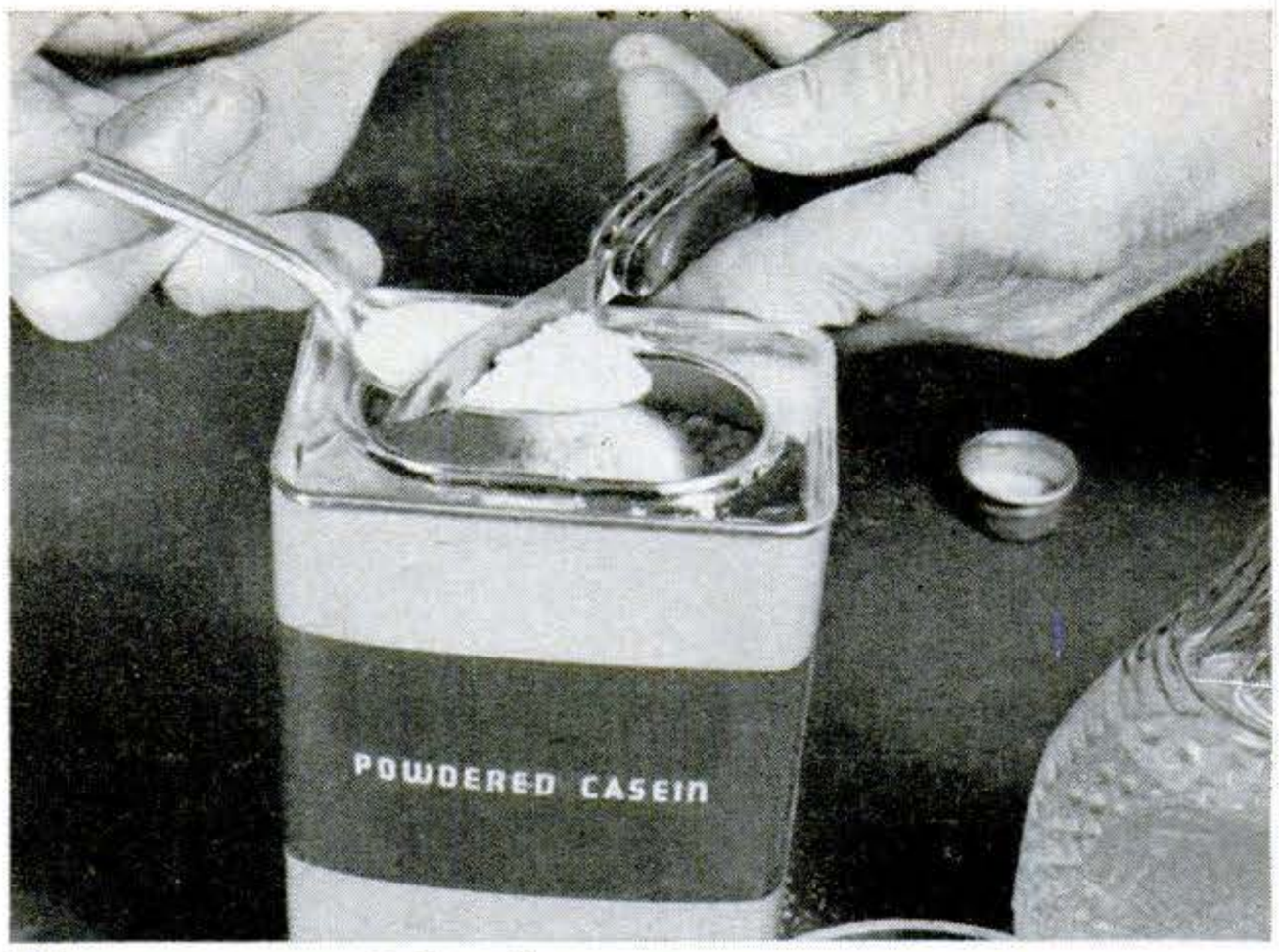
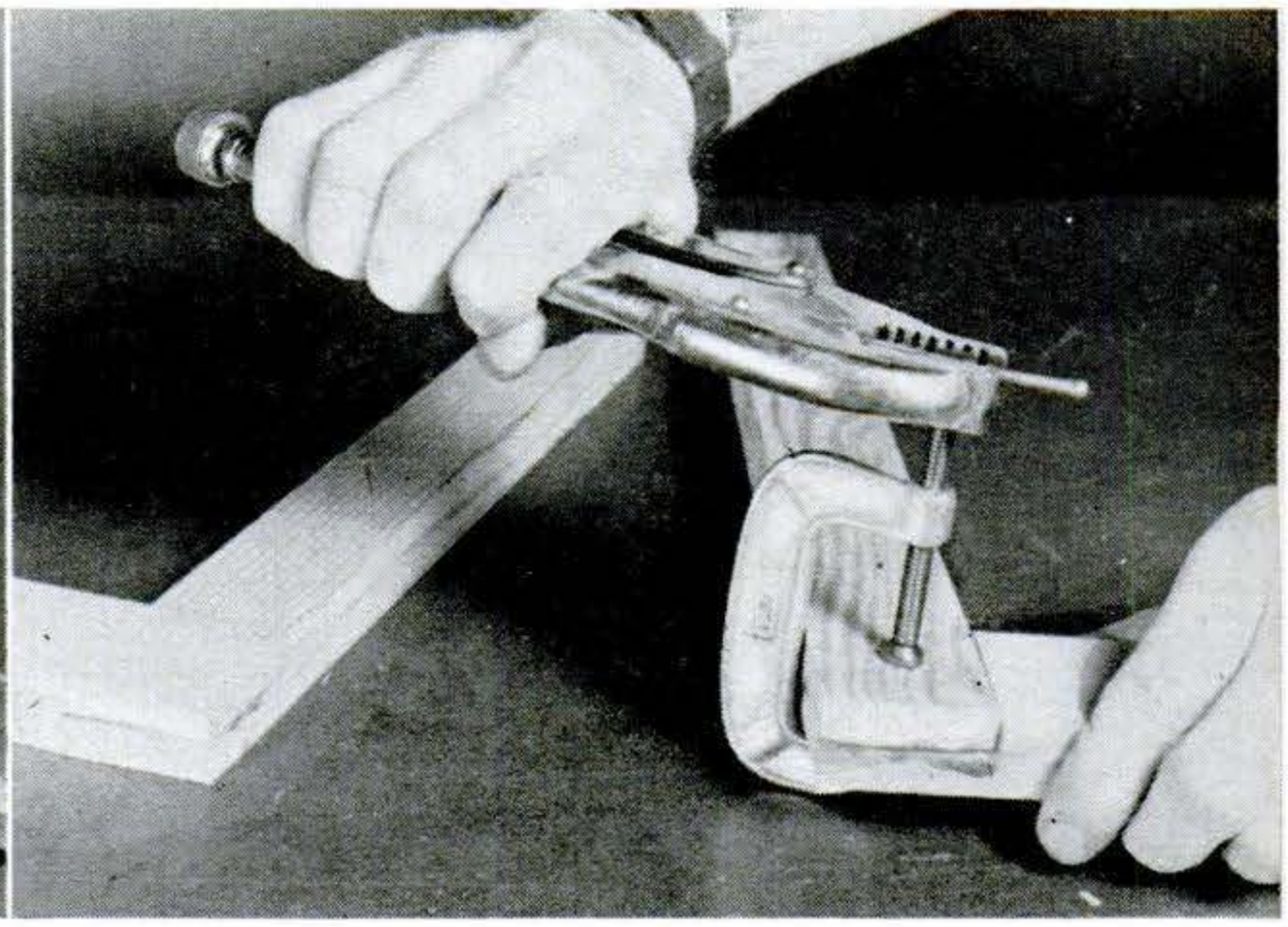
How to Glue Wood and Make It Stick

WHEN a glue joint fails, there's a reason. But post-mortems are no substitute for durability. Check your own technique against the pointers below. Clamping deserves special attention (see following pages). Pressure should be evenly distributed and sufficient to squeeze out the excess glue but not so great as to starve the joint of adhesive by squeezing it dry.



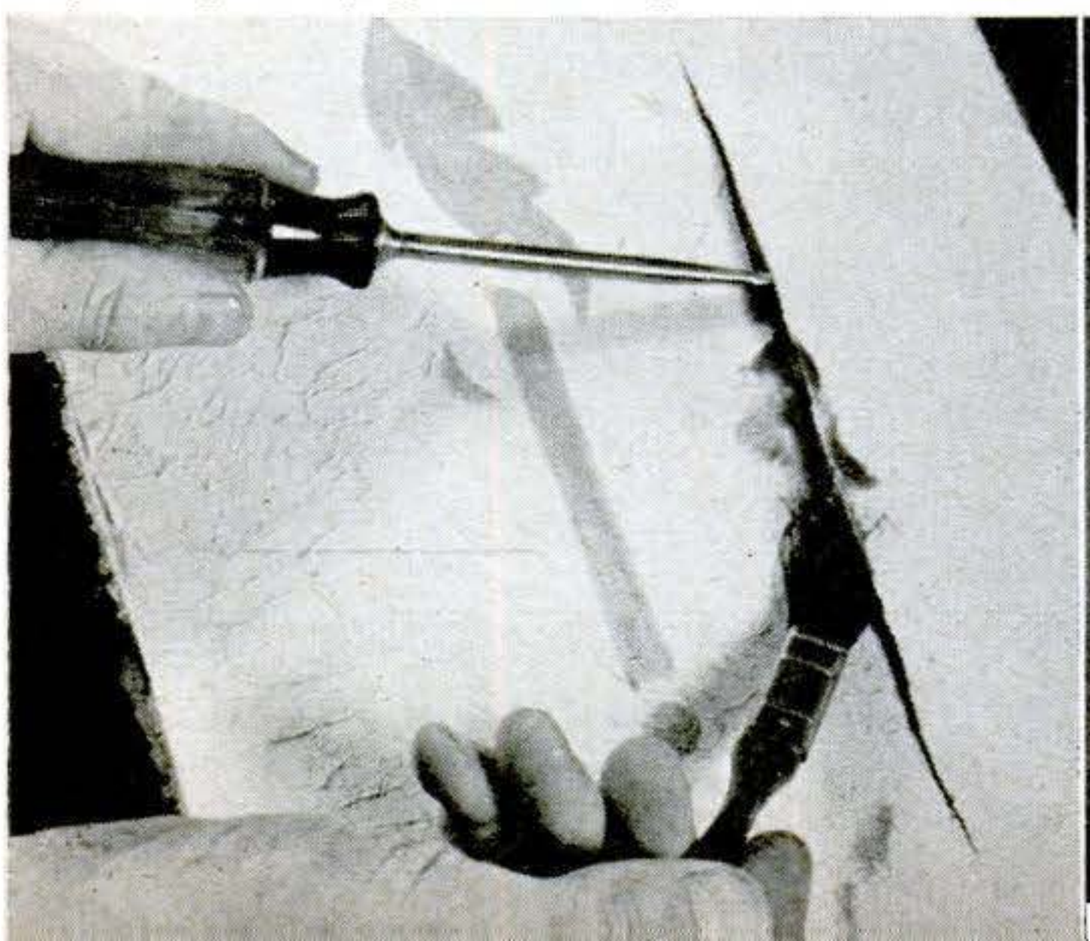
Measure it carefully if you want strong joints. There is a correct amount of water or catalyst for each powdered glue. Don't guess at proportions. If you use flake glue, mix each ounce with 1½ ounces of water, let stand overnight, use hot.

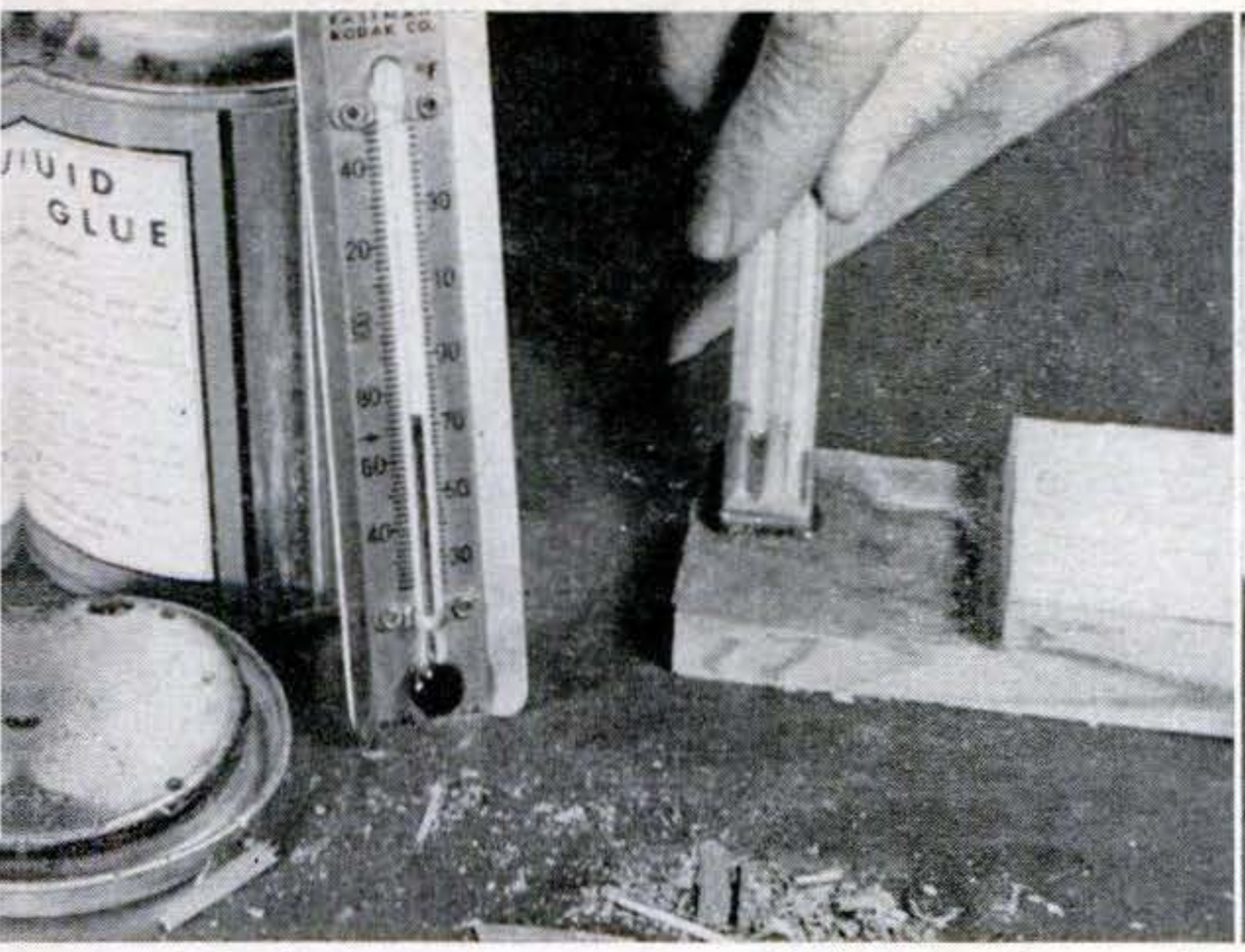
Clean old work. When regluing a broken joint, scrape or sandpaper down to bare wood. Most glues work by penetrating the porous wood grain; they can't get a grip on surfaces sealed by old glue or paint.



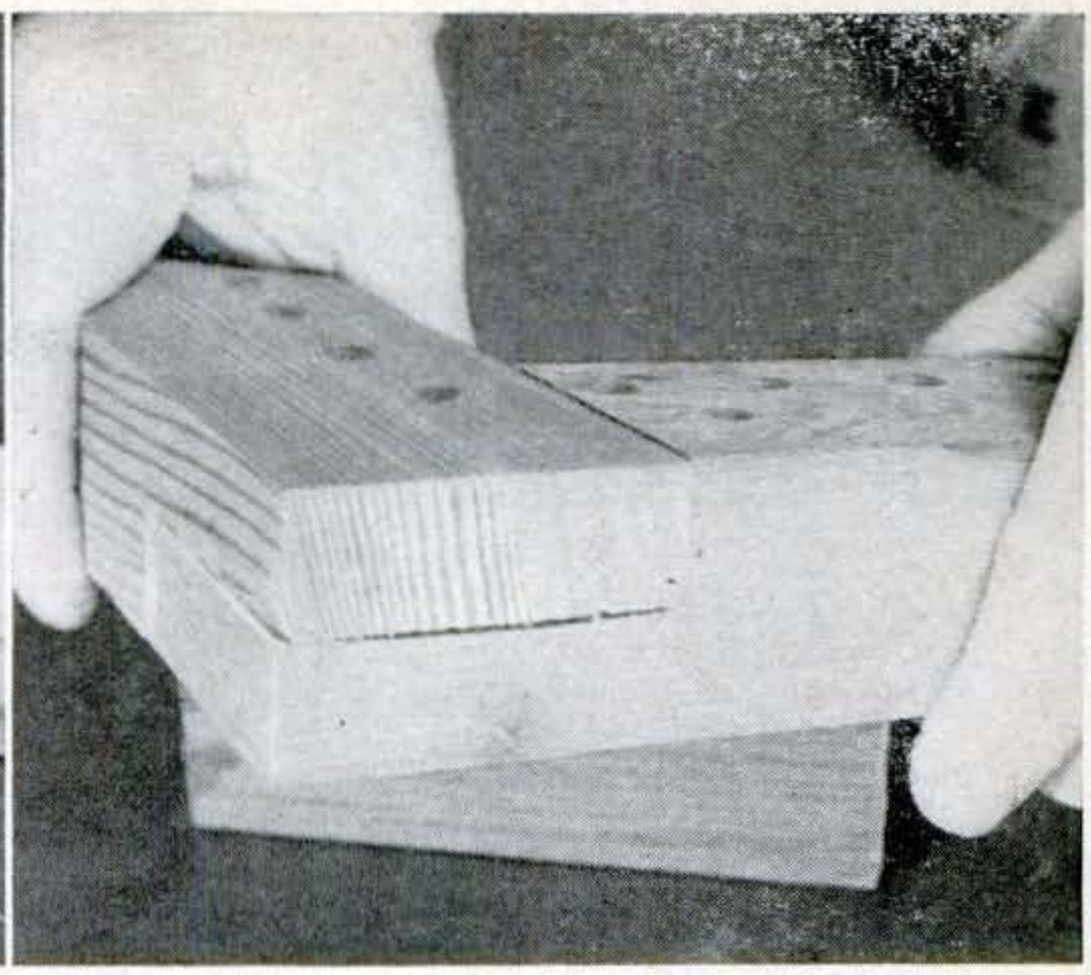
Clamp it properly. Shown above are two roads to a weak joint. At left, no clamp is used; at right, clamp is too tight, forcing most of glue out of joint, and there are no blocks to spread pressure and protect work.

Apply glue right. Don't wear the glue brush to a frazzle using it in the wrong place, such as filling cracks (below). There are many better ways of putting glue where you want it. Old saw blades and windshield wipers do a fast job of covering broad surfaces (below). An old photo-print roller is useful to spread an even layer of glue on a plywood panel. Chair rungs

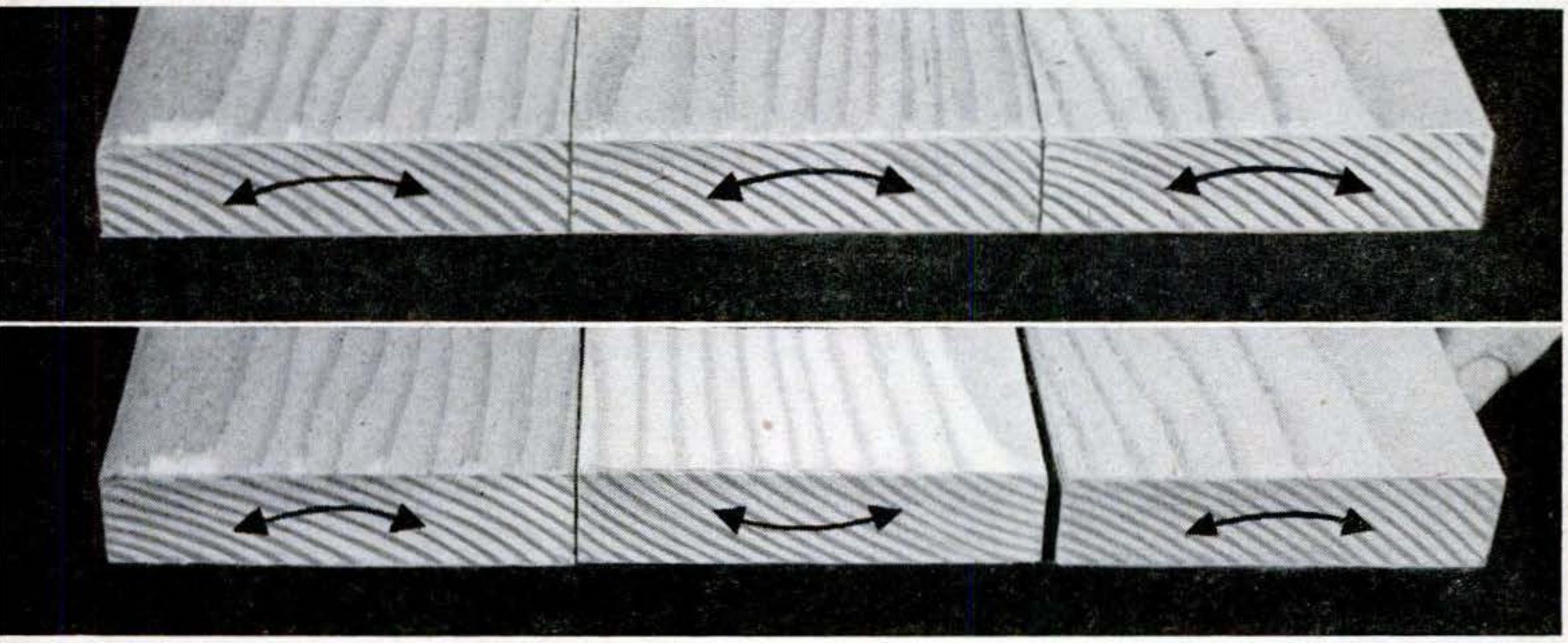




Watch temperature. Animal glues won't spread when cold, and plastic-resin glues won't set properly below 70°. For best results with all glues, have both the glue and the work at 70° or higher.

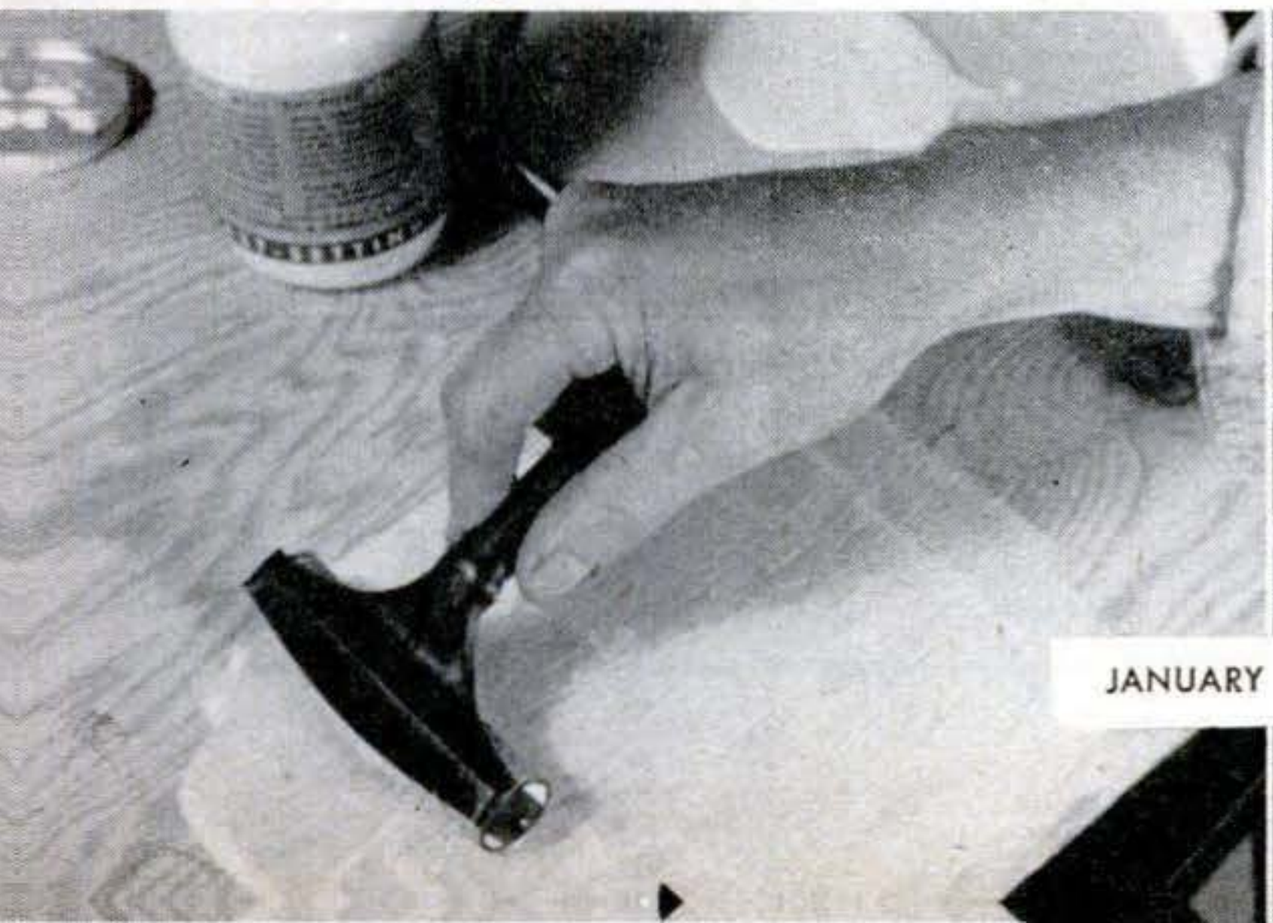


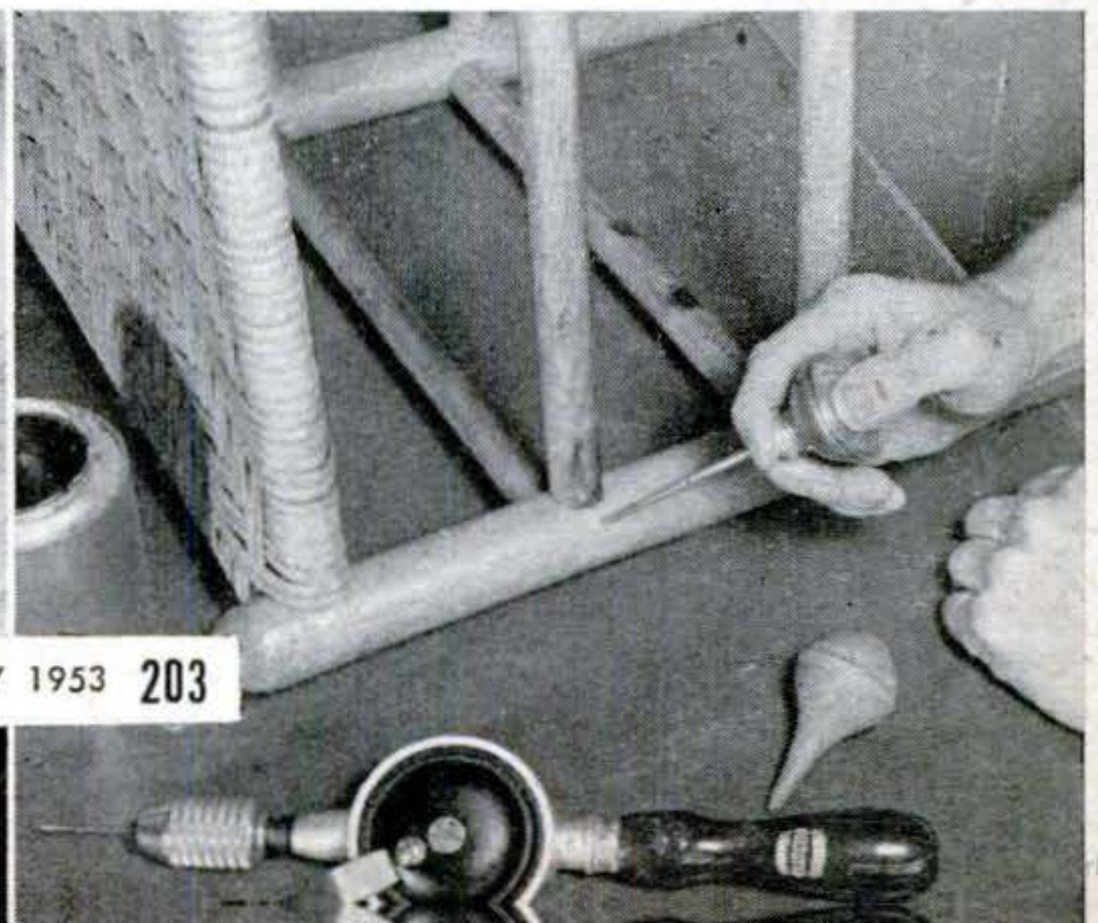
Make it fit. No glue produces a strong joint when the fit is as poor as this. Where you must glue a poorly fitted joint, as in repairing a loose chair rung, use an animal, casein or resorcinol glue if possible.



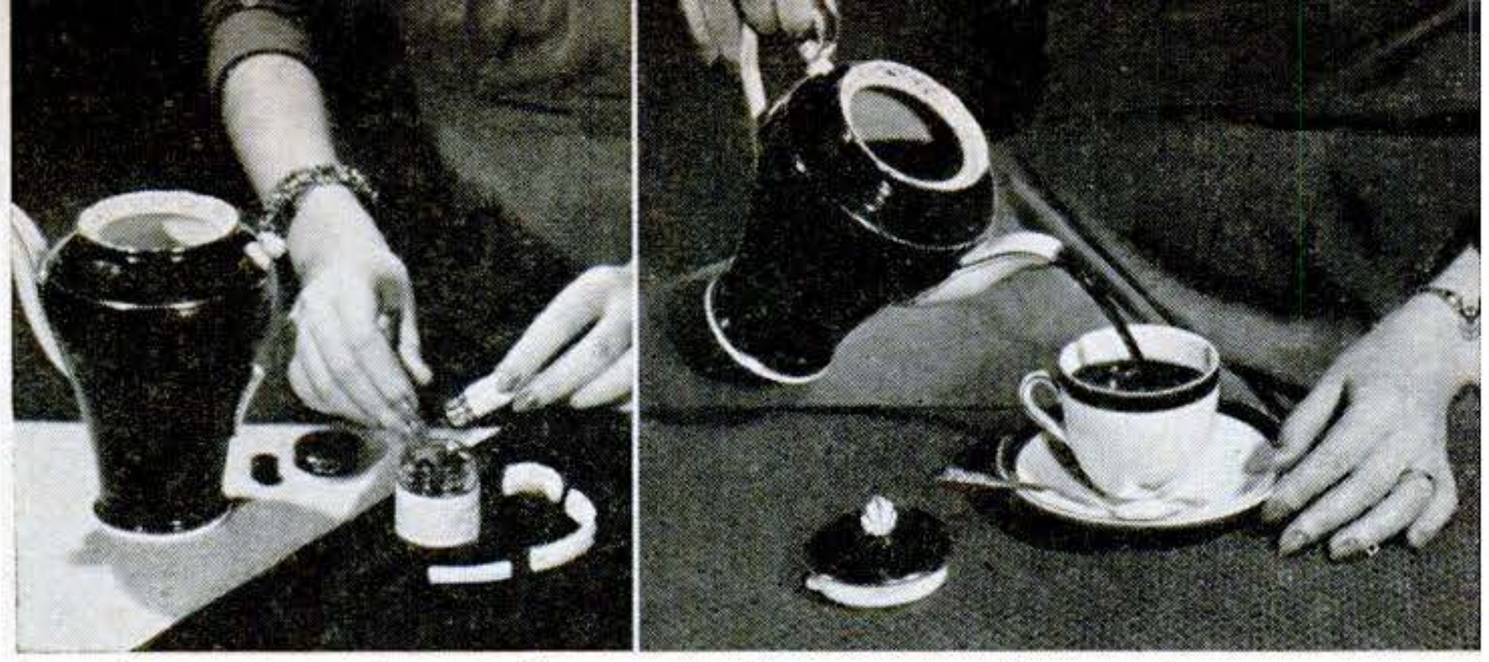
Alternate the grain. When gluing stock edge to edge—as for a tabletop—lay out the boards so that the direction of grain alternates, presenting the heartwood side of the grain *up* on every other board. In upper photo above, all grain curves downward, increasing the chances that finished piece will bow later. In lower photo above, center piece is turned heartwood side up, canceling out tendency for finished piece to cup in one direction.

or other similar joints can be reglued without pulling them apart if a small hole is drilled into the dowel hole and glue pumped into it with an oil can. A hypodermic needle will shoot small quantities of glue under blistered veneer, and a paint-striping tool will spread it in narrow ribbons for grooves, inlay borders, cracks and other long thin work.





Special Adhesives for Special Jobs



Catalyst-type cement does a really tough job on china, pottery, glass and metal. Here it easily mends a broken coffee-pot handle, providing a strong bond that resists heat, moisture and stress of handling.

THERE'S a wide choice of adhesives for sticking together an even wider assortment of things not made of wood. Most of them work on many materials.

Cellulose household cements (such as Duco, Ambroid, Testor's and John Collins) do a fair job on practically anything. Use them with china, glass, pottery, leather, fabrics and plastics. Joints should be clamped.

Black mastic adhesives (such as Magigrip, Miracle Black Magic) work on both porous and nonporous surfaces. They'll grip tile, glass and mirrors, metal plates, asbestos board, bricks and a lot of other things. They don't require tight clamping but won't take much stress.

Flexible cements (such as Casco Flexible) are light-colored and handle many similar jobs. Spread this type on both surfaces, let it get tacky and join. Good for joining porous materials (wood, paper, felt, canvas, plaster and leather) to each other or to metal, glass, foil, plastics or linoleum. A surprisingly strong bond can be had with such difficult combinations as wood-to-metal.

Catalyst-type cement (such as Stik-All) is a new development for problem materials like china, glass, pottery and metals. It does a superior job without tight clamping and stands up to heat, but you have to mix it for use and it's tricky to mix less than a dollar's worth.

Special-purpose adhesives are best used for critical jobs. Stick a plastic toy back together with plastic cement, but if you work regularly with a plastic, get the solvent cement made for it (toluol and even carbon tet work on most molded plastics).

One specialized adhesive is a new type for putting down counter tops of the Micarta type. Stix and Armstrong's D-243 are examples. They grab so fast that you can put the counter top tightly in place with a roller or mallet without clamping. Of course, with proper clamping, you can do as well with ordinary resin glue.

GLUING PROCEDURE

Type Glue	How to Prepare	How to Apply	Minimum Room Temperature	Setting Time at 70° Softwood	Setting Time at 70° Hardwood
Liquid animal or fish	If room is cold, warm glue to 70° or higher.	Spread on both surfaces; let get tacky before joining.	Sets best above 70°, but can be used in colder room if glue is warmed.	12 hours	24 hours
Casein	Mix equal parts glue and water. Let stand 10 min. and stir again.	Use within 8 hours after mixing. Put on a thick coat.	Any temperature above freezing, but the warmer the better.	2 hours	4 hours
Polyvinyl	Comes ready to use.	Spread on and clamp at once.	Any temperature above freezing. Sets faster if warmed.	20 min.	30 min.
Plastic resin	Mix 2 parts powder with ½ to 1 part water.	Apply thin coat to one surface only.	Must be 70° or warmer. Will set faster at 90°.	4-6 hours	5-7 hours
Resorcinol	Mix 3 parts powder to 4 parts liquid catalyst.	Apply thin coat to both surfaces, clamp.	Must be 70° or warmer. Will set faster at 90°.	8 hours	10 hours
Flake or powdered animal	For each oz. glue add 1½ oz. water (softwood) or 2 oz. (hardwood). Keep hot and use at 140°.	Apply with brush, work fast and warm joint for best results.	Must be 70° or warmer. A heat lamp is useful during assembly and setting period.	12 hours	24 hours

FOR YOUR *POPULAR SCIENCE MONTHLY* INFORMATION FILE

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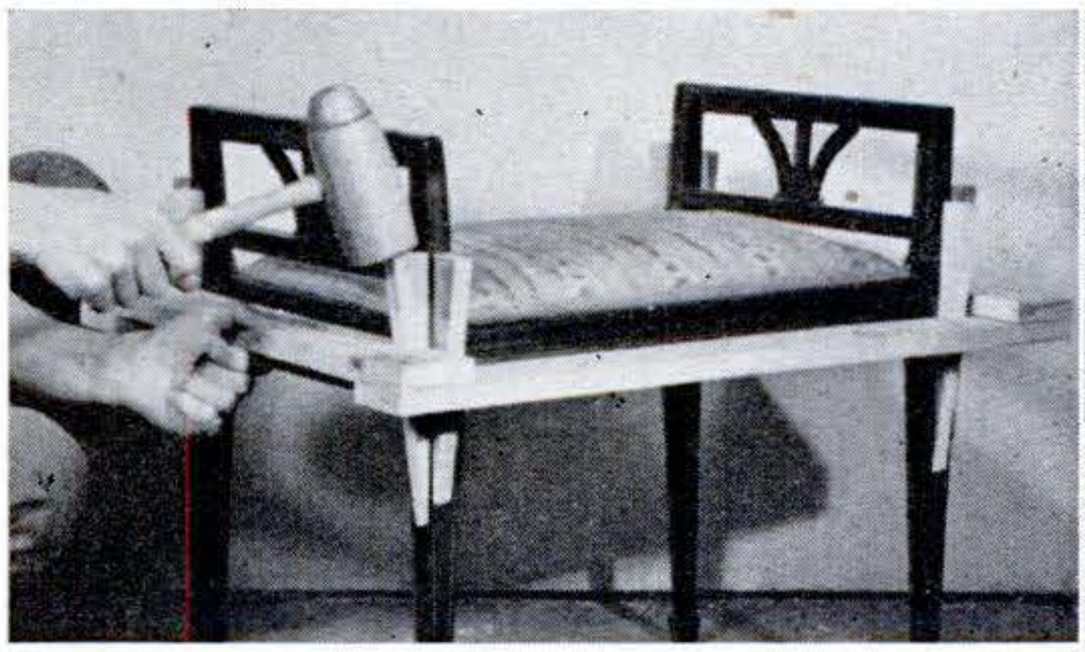
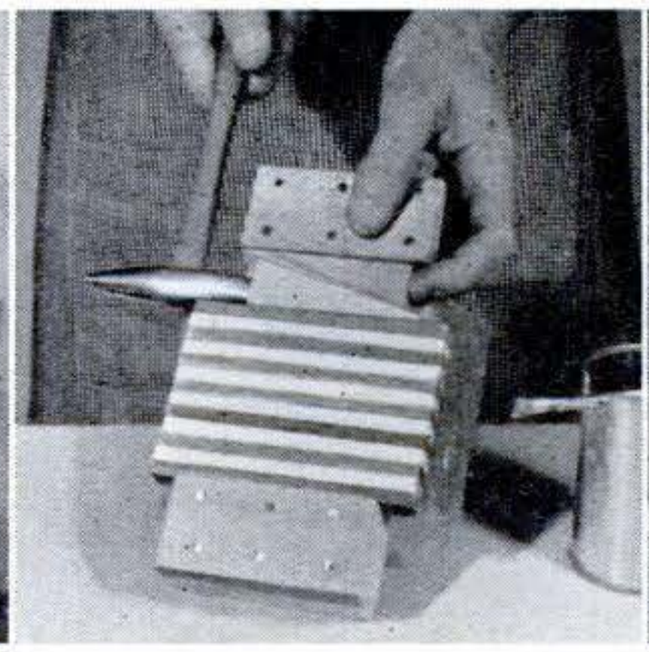
Gluing Clamps and Jigs You Can Make

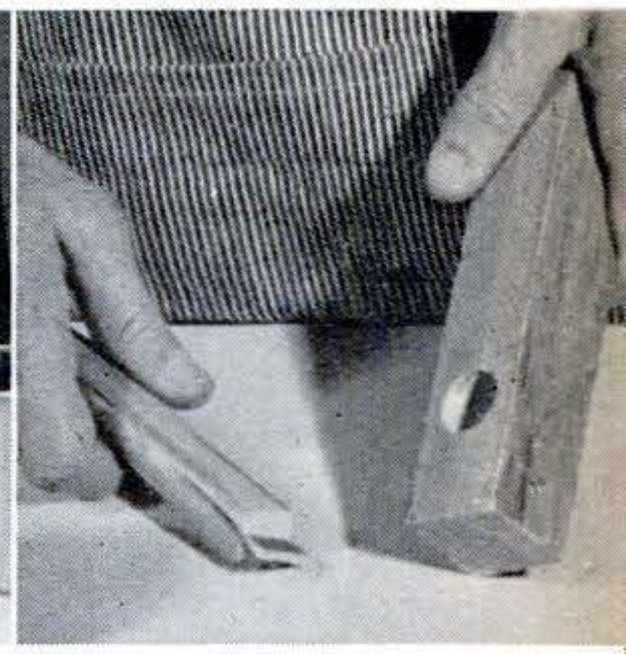
PREPARING the work and getting glue on it is only half the job; *holding* the parts together while the glue takes a grip on them is the other and possibly the more important half.

Clamps are usually accumulated through the years, and chances are you don't have all the clamps you need. You can still build good healthy glue joints though, using homemade methods of applying pressure. Even if your shop wall is loaded with clamps, you'll find times when no factory-made clamp will quite suit the job. One of the ideas that follow may be the answer to the job that sticks *you.*

Utilize the Squeezing Action of Wedges

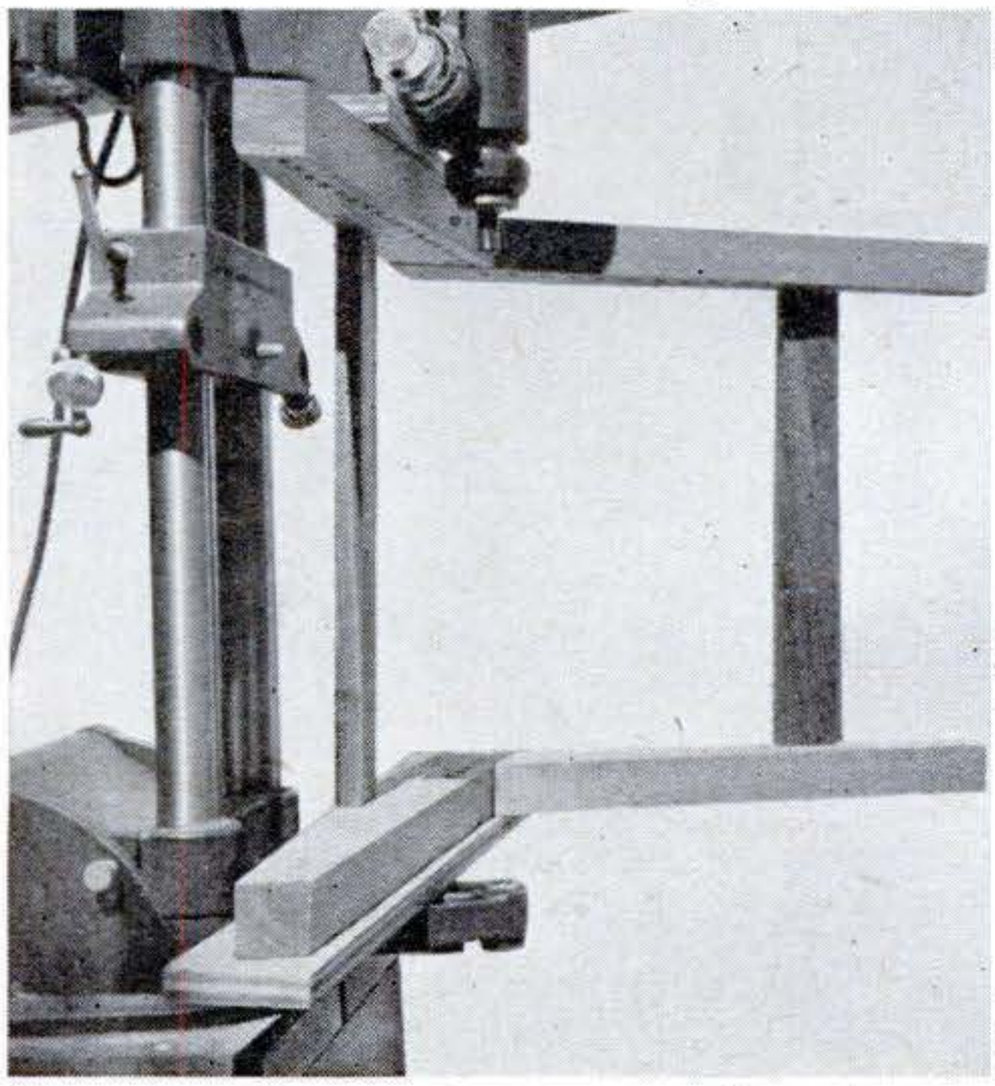




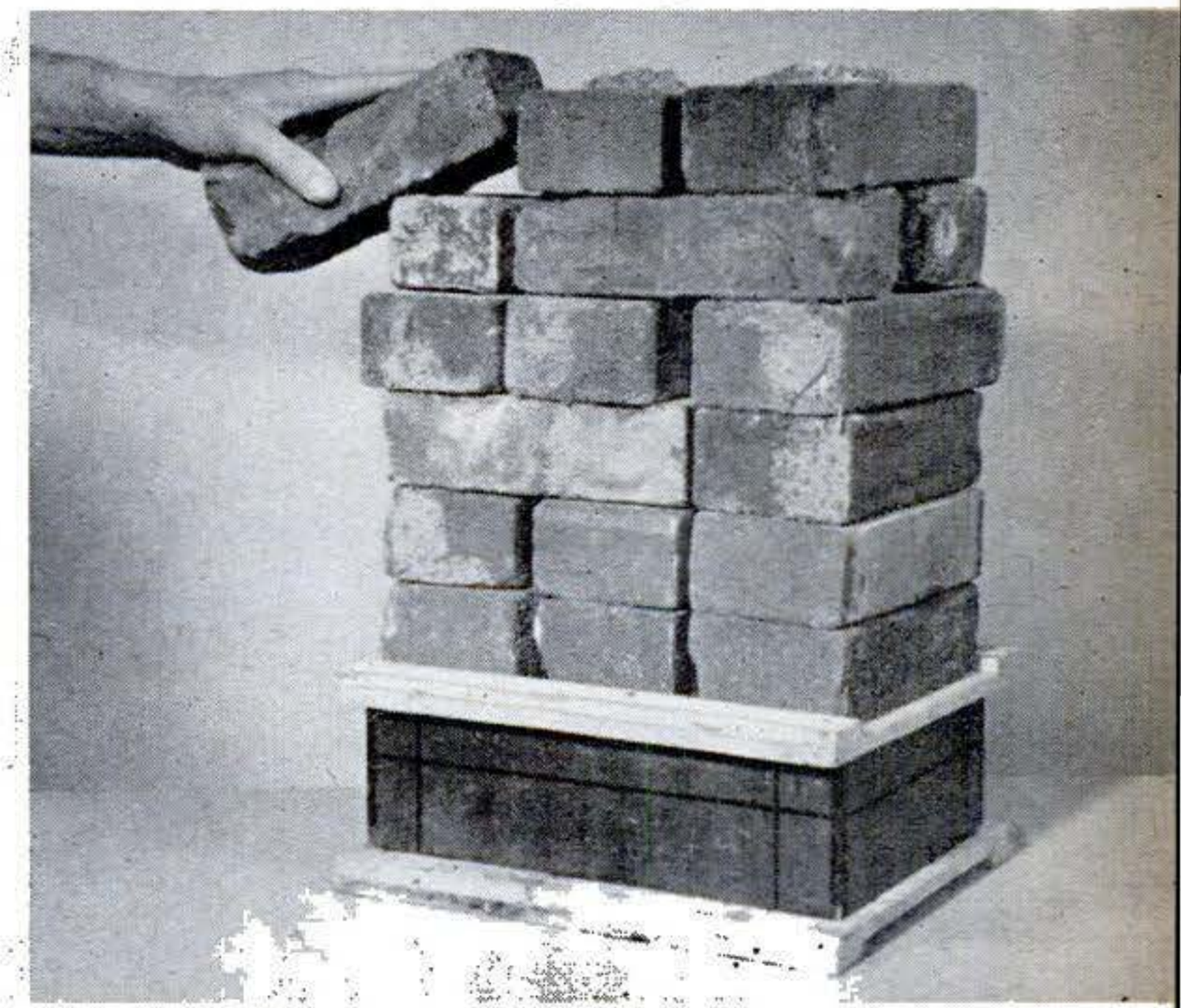


Wooden wedges can supply a lot of pressure. Tenon joints in stool at left above had loosened with age. Old glue was cleaned out, new glue applied, and joints forced tightly together by wedges driven into a wooden frame made slightly larger than the stool. Strips of walnut and maple (center photo) are glued together in a wedging jig consisting of two blocks of wood nailed to a flat board. At right above, the wedge becomes part of the joint. Force a hardwood wedge into a saw kerf in the end of the peg or chair rung and apply glue. As the rung is driven into the blind hole, the wedge is driven all the way into the cut, expanding the rung end tightly against the sides of the hole and squeezing out the excess glue.

Let Gravity Come to Your Aid in Clamping



Heavy drill-press head provides plenty of weight in easily handled form. Just put the glued-up work together, set it on the drill-press table and ease the head down on it when you release the column clamp.



Bricks, piled on top of each other, concentrate weight on one spot with little effort on your part. Here they put a 90-lb. load on less than one square foot. A large tub can also be placed on work and filled with water.

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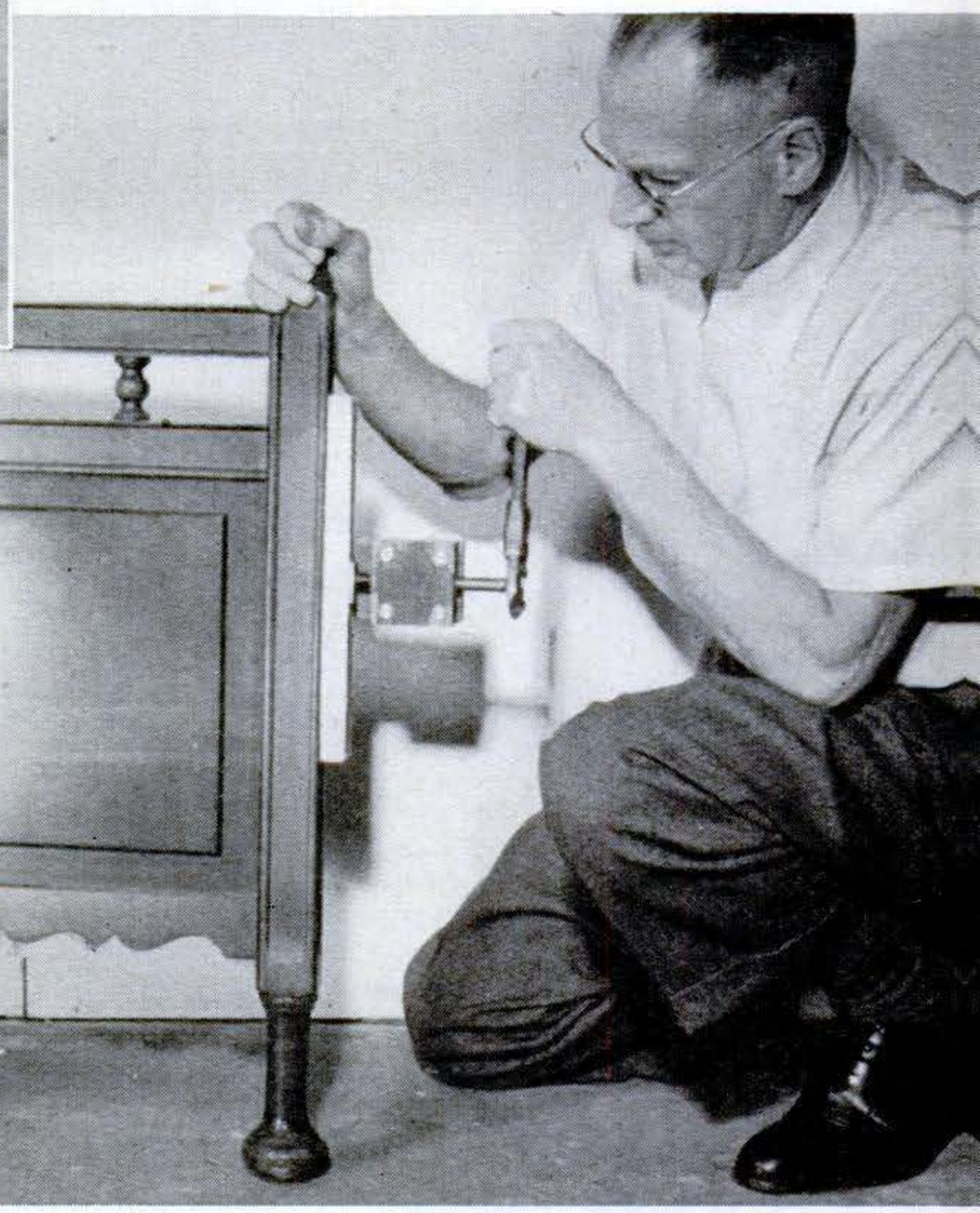
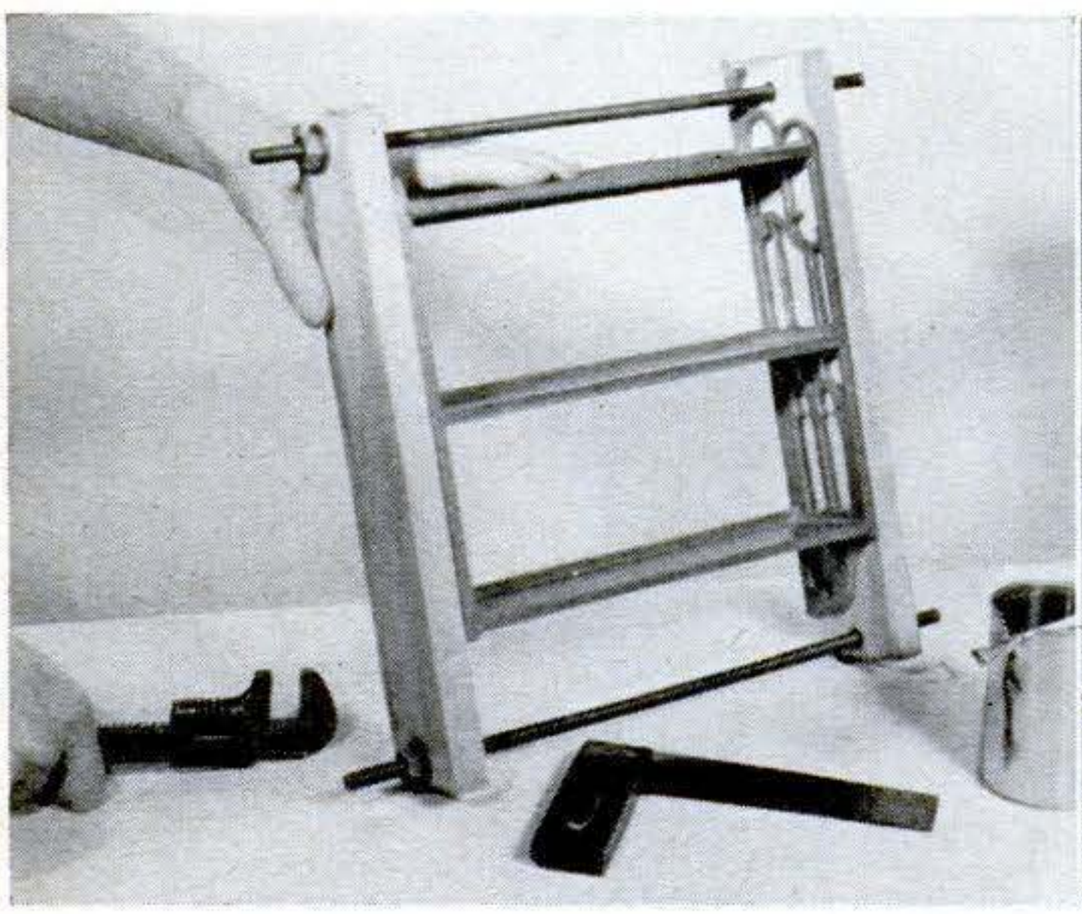
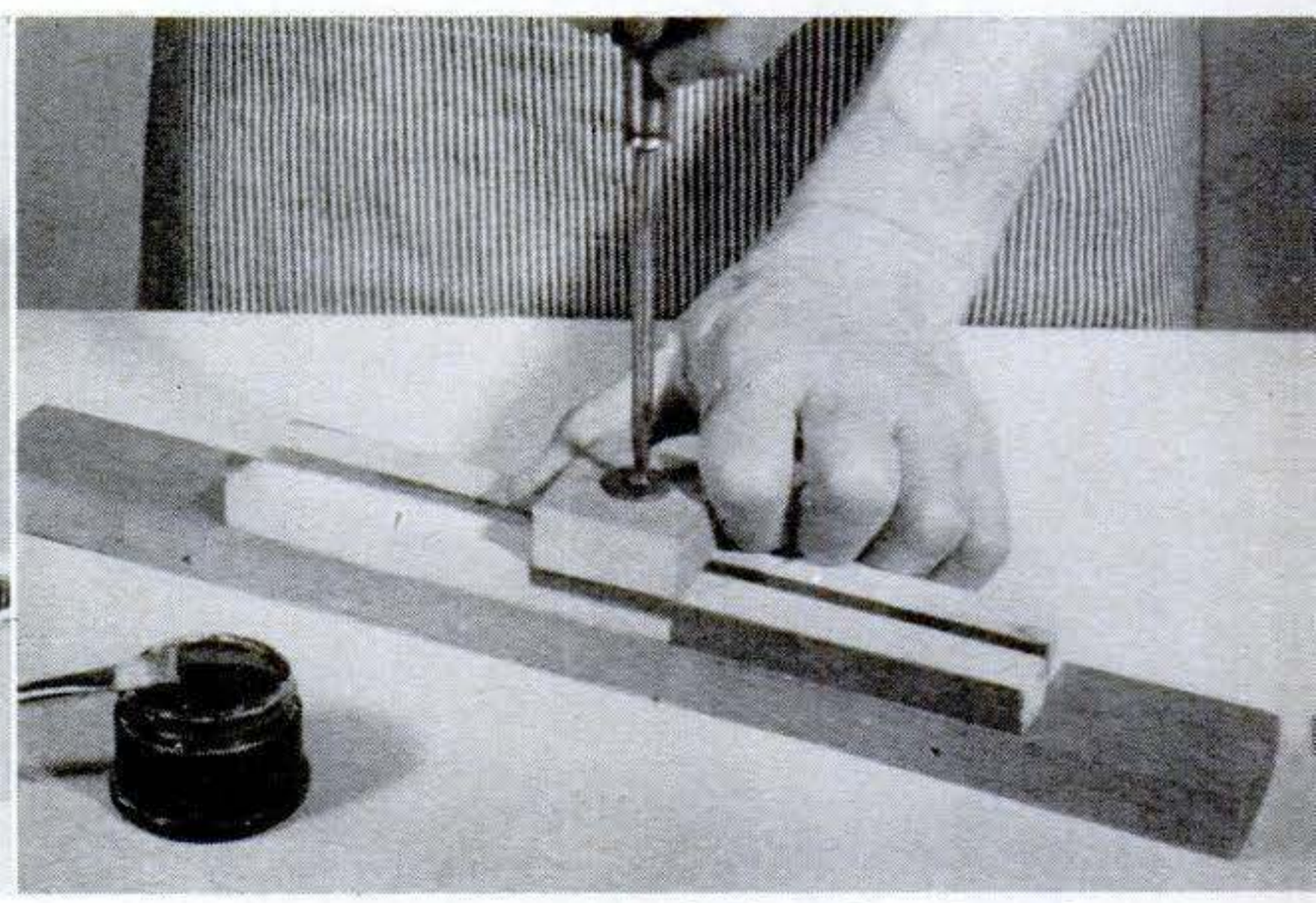
Let Bolts Put the Pressure on Your Work

Husky bolt, threaded into nut set in block of wood, becomes head end of homemade bar clamp. Wood block is screwed to a length of two-by-three, and plain block is screwed to opposite end at length suited to work. Bolt bears against bit of metal (in foreground at left) to prevent digging in. Below, headboard of bed is clamped with gadget.





Two threaded rods or long bolts put the squeeze on many awkward assemblies. End boards should be thick enough to eliminate any tendency to bow out in middle. Check squareness of work as you tighten.



Jig for lap joints. A straight board, bolt and block of wood make this jig for clamping two half-lap joints at once. Straight board assures that splice will be as straight as single long piece. Waxed paper keeps work from sticking to jig.

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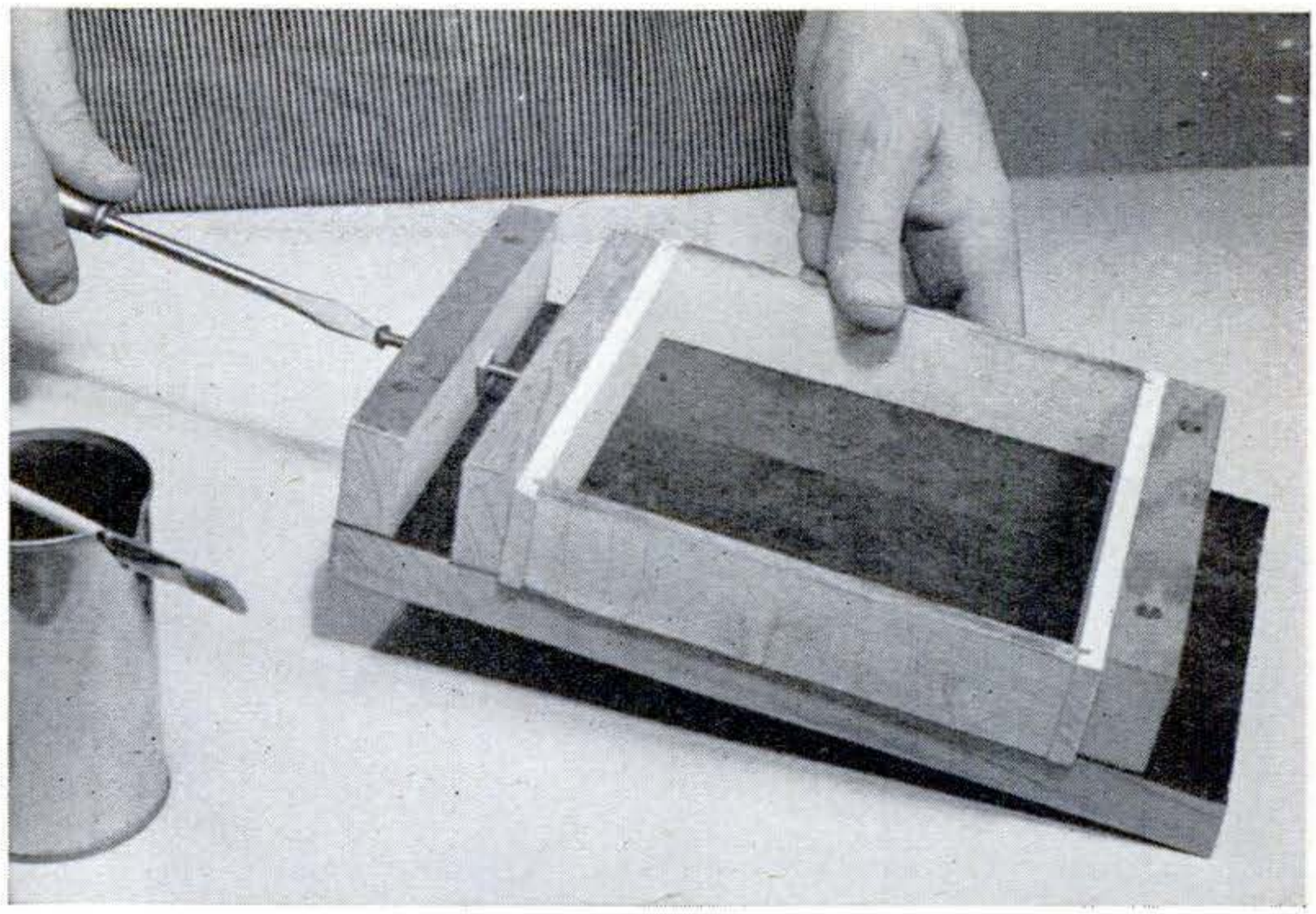
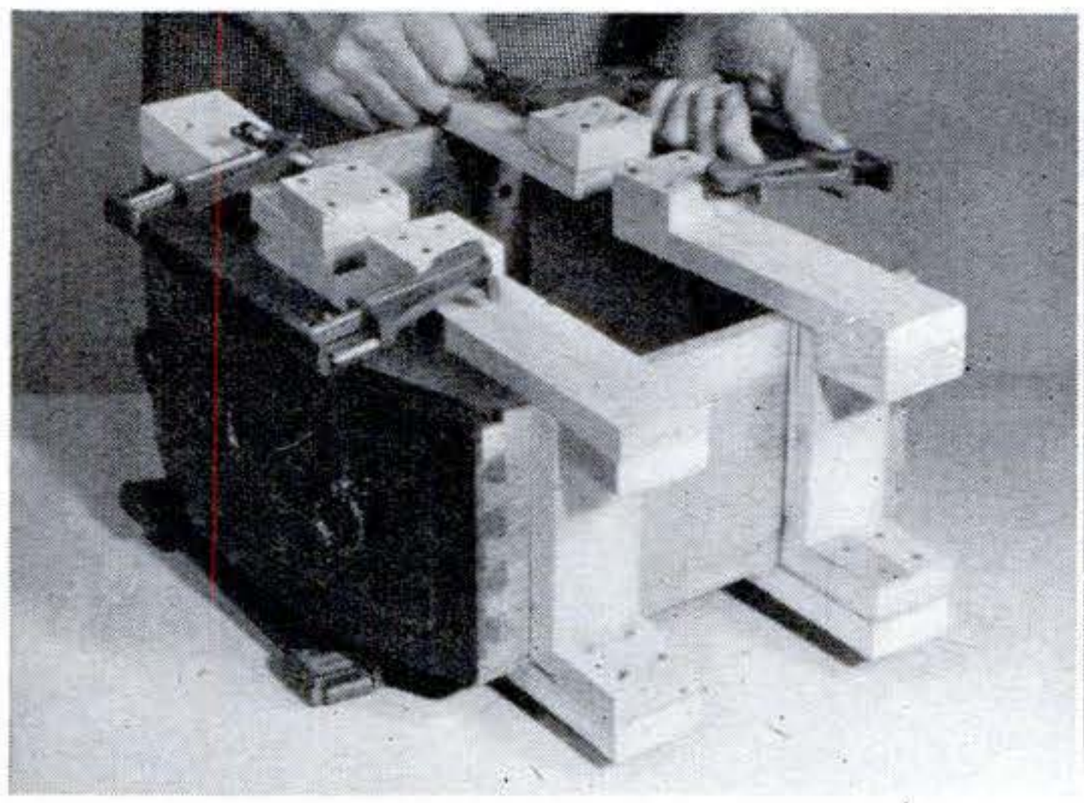
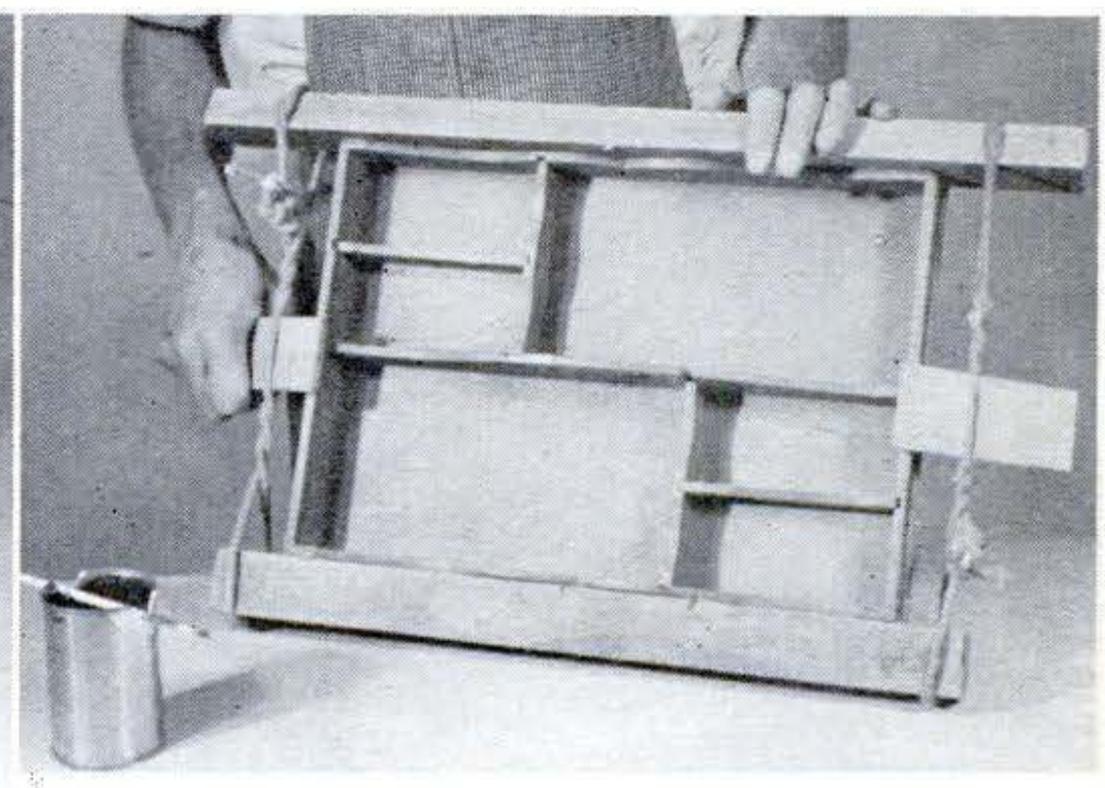
Drawer jig is a widened version of homemade bar clamp. Two bolts instead of the one shown here will give more pressure and permit equalizing it. Larger jigs of this type should have three or more tightening bolts. Handy glue container in foreground is tin can notched at both sides to keep glue brush handy.



Improvise with What You Have to Get Clamping Pressure

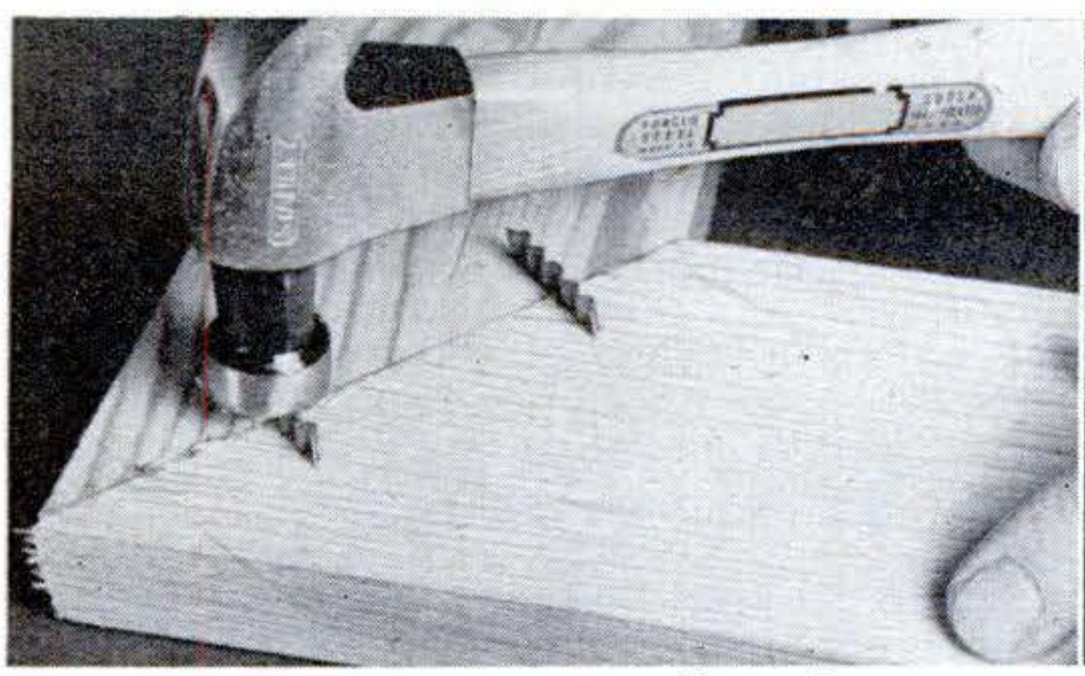


Small clamps do big job if you use them right. A set of wooden hooks—strips of wood with blocks nailed to them—allow small, inexpensive clamps to do the work of large ones. Only four clamps are needed for this drawer-gluing setup.

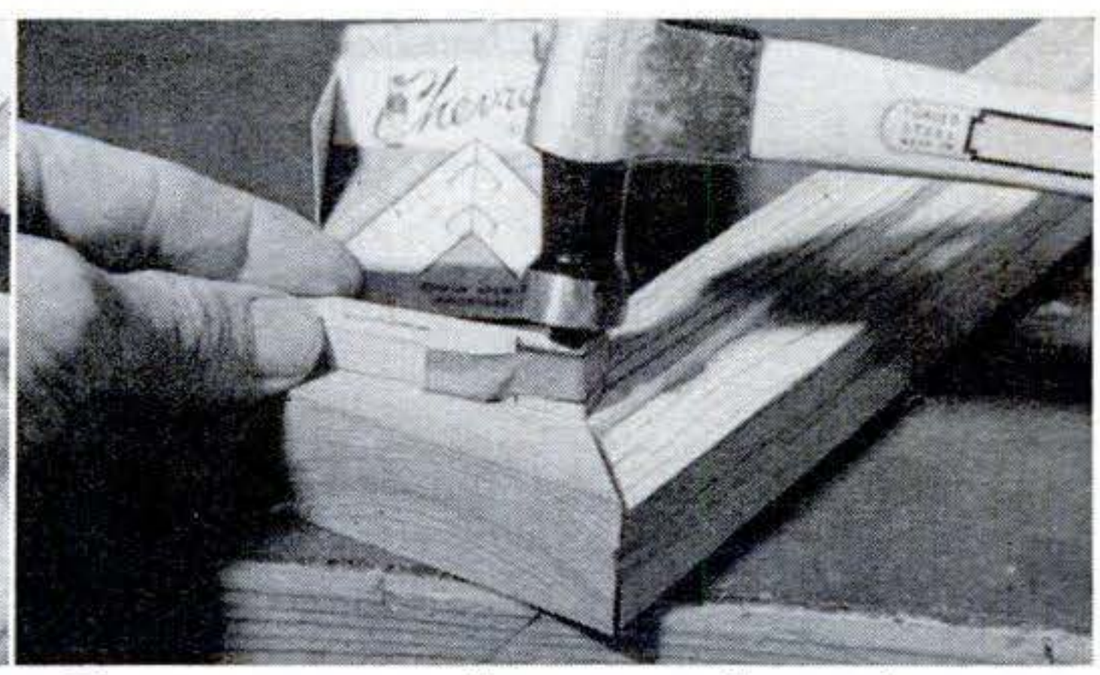


Spanish windlass still comes in handy. A pair of rope tourniquets pulling two stout lengths of lumber against the work is the granddaddy of all clamps. For extra pressure, wet the rope so it will shrink on drying.

Permanent Fasteners May Substitute for Clamps on Some Jobs



Corrugated fasteners are made with corrugations at slight angle toward each other to pull work together when they are hammered into it. They are especially useful for rough work or where only one side shows.



Chevron type is bent at right angles to go around a corner joint. This kind of fastener can be used on narrow work. They are packed wi a small tool for countersinking them neatly of sight.

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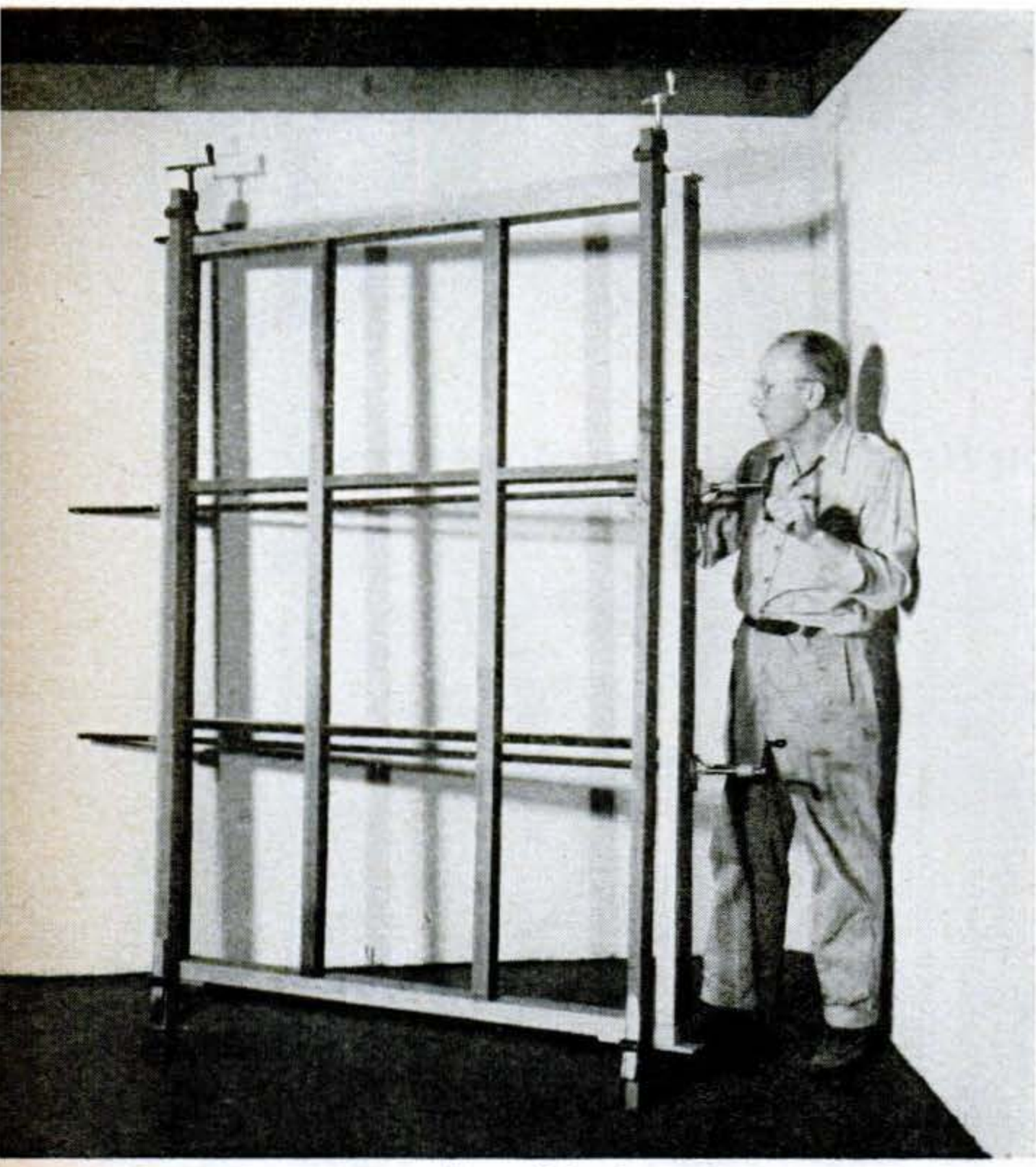
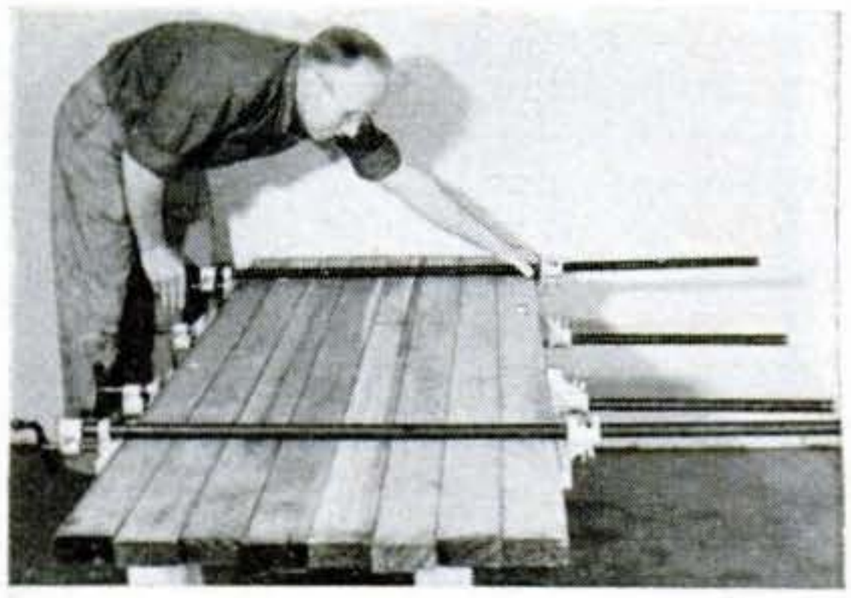
Building a Clamp Collection

ONE woodworking expert says "Clamps are the craftsman's third hand." And, he adds, the most annoying deficiency in the average workshop is in the clamping devices—the ones that aren't there.

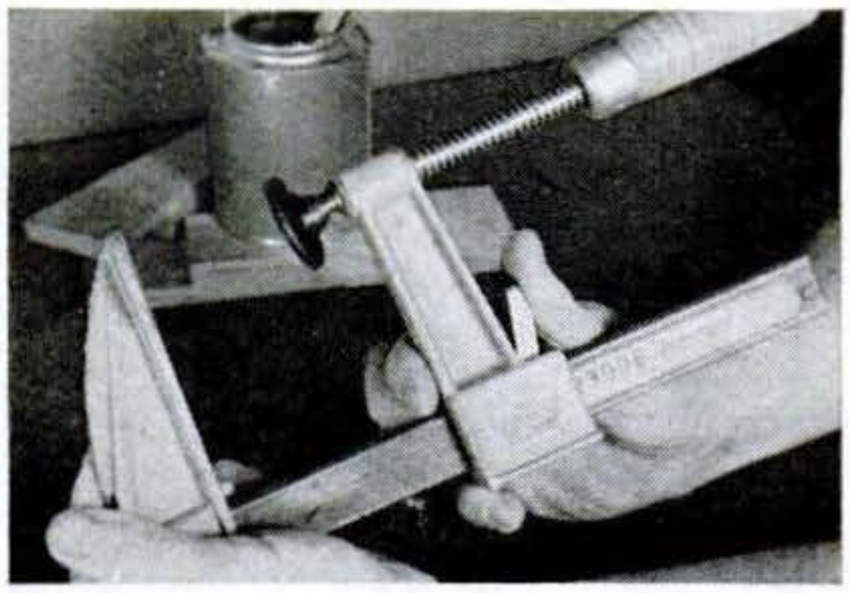
You probably have a number of small *C clamps*, so begin your collection with a few *long clamps*—either the bar type or the kind that fits on ¾" pipe. Next to add should



Long clamps are a "must" for large framing and cabinetwork. The two vertical clamps shown are the poor man's pal. The metal parts aren't expensive, and can be quickly fitted to long wooden bars. Other two are 6′ bar clamps.



Clamp fixtures that fit on ¾" pipe—head threads on, foot slides—are about as efficient and rigid as costlier bar clamps. Sets of pipes of different lengths can serve one set of fixtures to handle a variety of work.

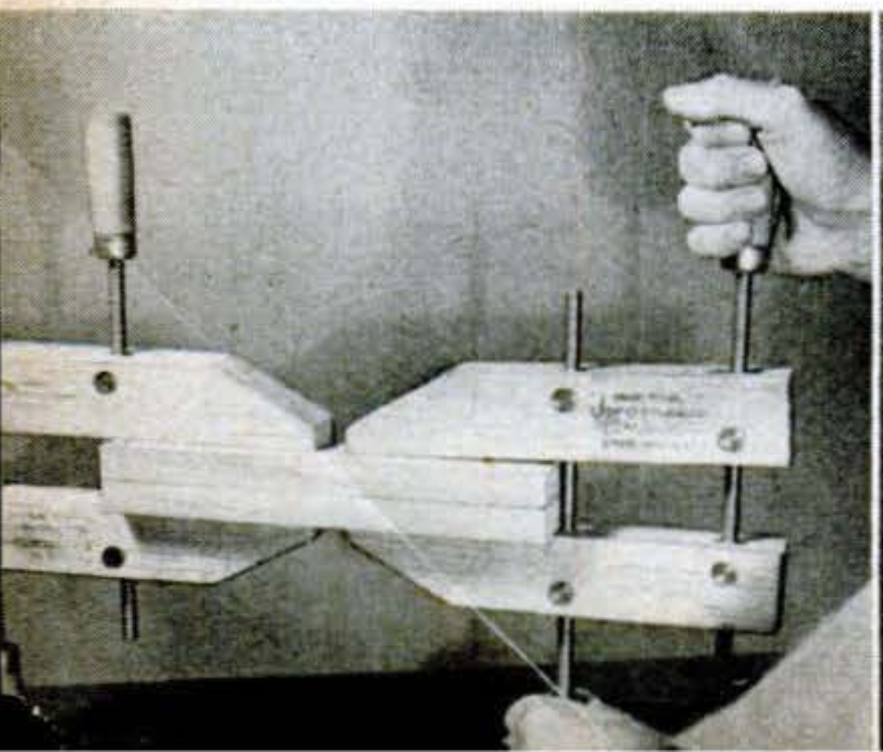


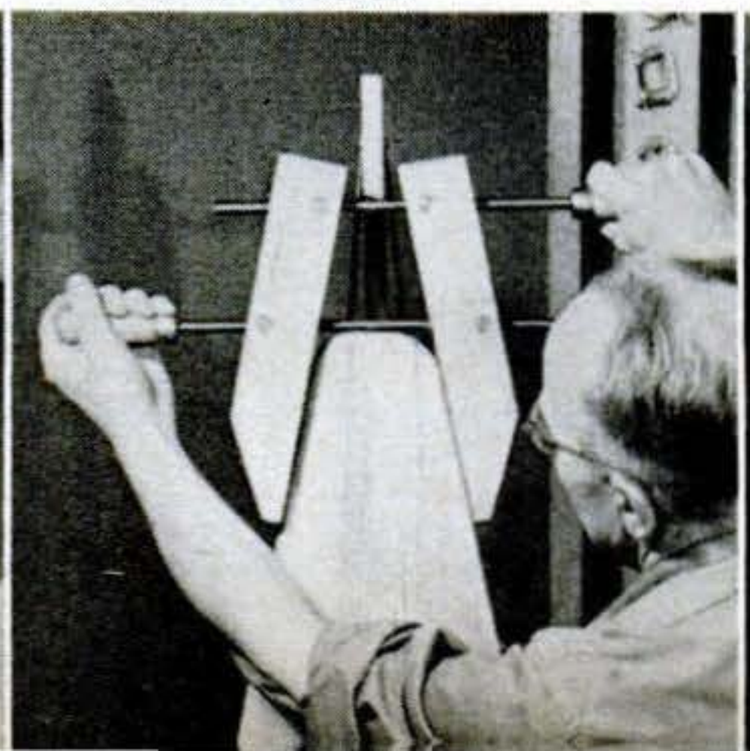
Short bar clamp is cross between regular bar clamp and C clamp. It can be adjusted to size in an instant by sliding the head (in some models the foot) along the bar, a good feature when your hands are full.

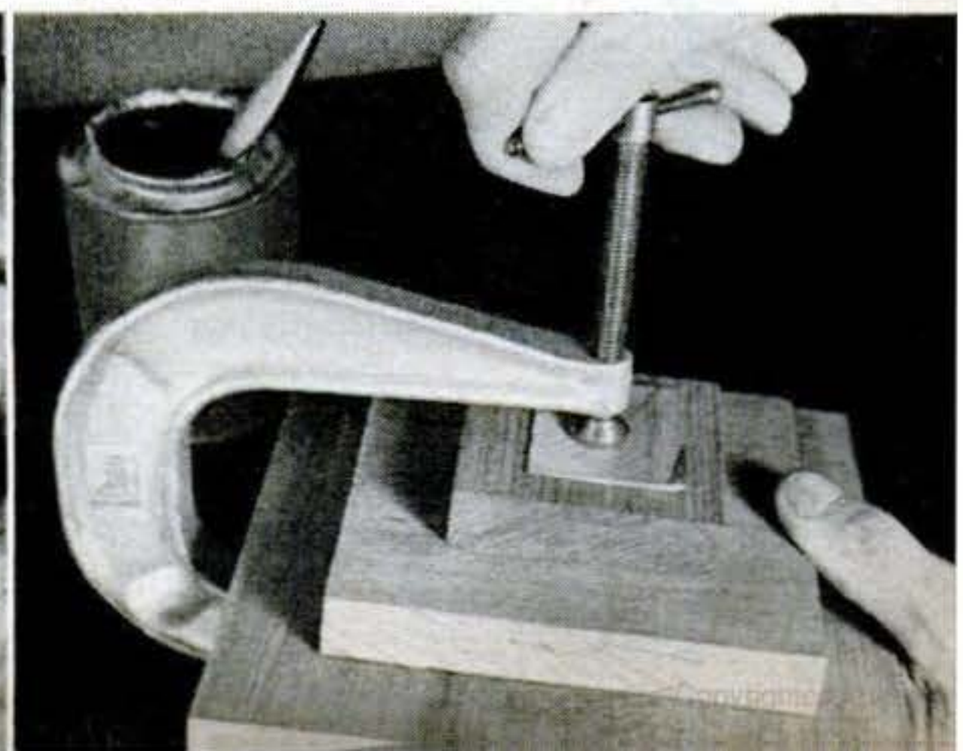
Hand screw (frequently called a "Jorgensen") is *the* woodworkers clamp. Its wooden jaws will not damage the work. Clamp at right below is not adjusted properly; it should grip the work with parallel jaws, like one at left.

Uneven surfaces like this ironing-board end are clamped with ease with an adjustable hand screw. Screws are quickly opened or closed down to size by gripping both handles and cranking the screw in either direction.

Deep-throated C clamps will reach into the center of small work where the pressure is most needed. These are of all-metal construction and small wooden pads must be used to protect the work from their jaws.





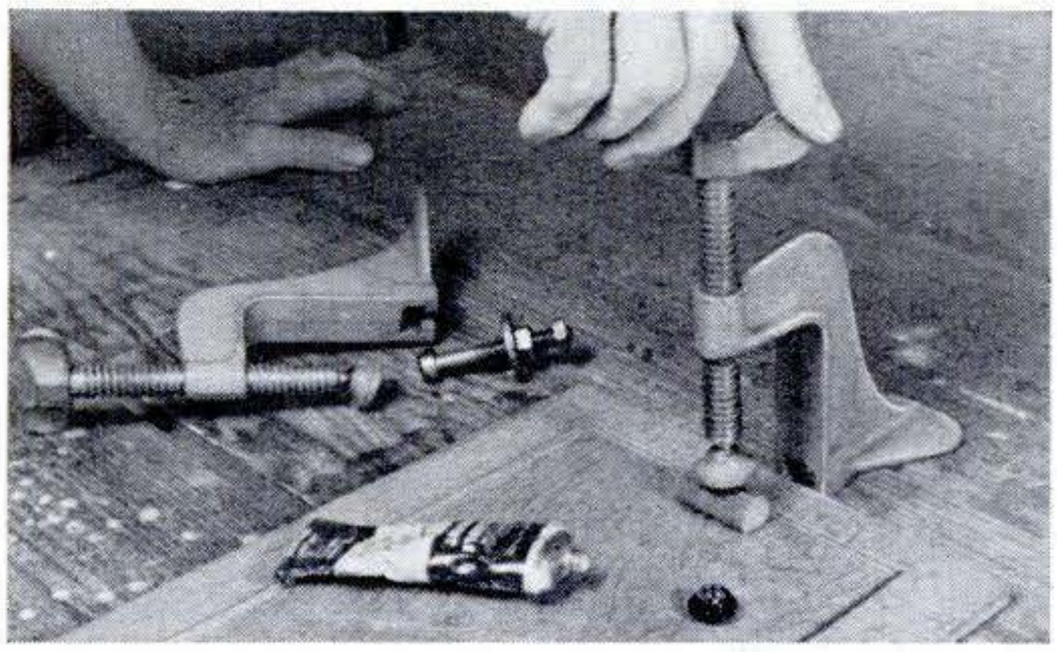


be some wooden-jaw *hand screws*—the larger the better. At this point you're set for most jobs and you can think about some specialized clamps.

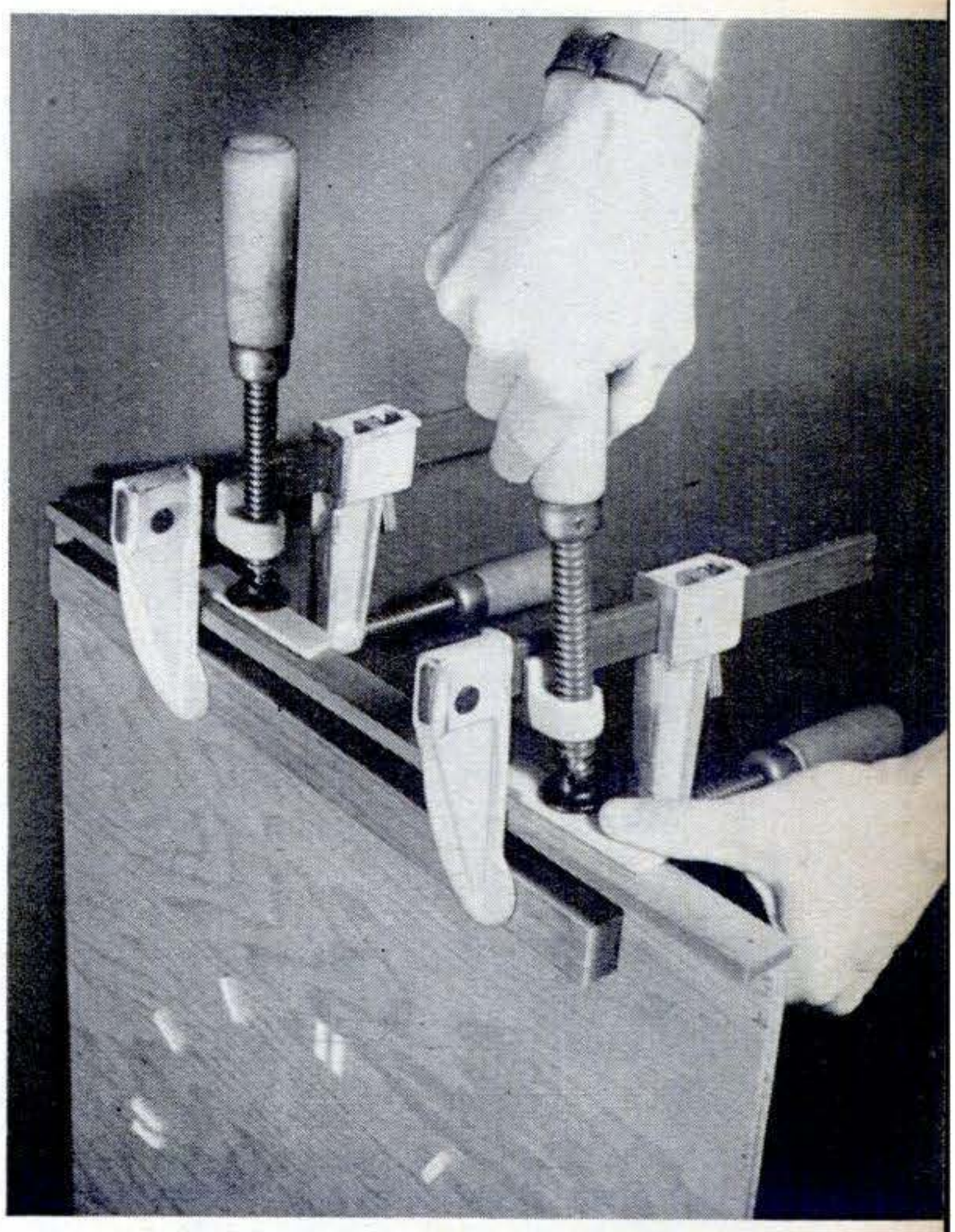
Press screws head the list of specials; they are very handy for rigging up all sorts of gluing devices, including veneer presses.

Edge-clamp fixtures attach to short bar clamps for gluing edge trim along counter tops. *Miter clamps* make frame building easy, and a *band clamp* is practically a necessity if you are working with round or curved shapes. A set of *spring clamps* is mostly for convenience (they can be applied with one hand while the other holds the work), but once in a while you'll find a job where nothing else will work. The same is true of *surface clamps*.

Band clamp wraps itself around curved or round work and squeezes it from all directions. You can get these clamps with either steel or heavy-canvas bands. Canvas is best for irregular shapes, steel for round or oval shapes.



Surface clamp or bench clamp is attached to bench top with special bolt that fits in T slot. When clamp is removed, head of holding bolt slips down into counterbored hole, leaving bench surface clear.

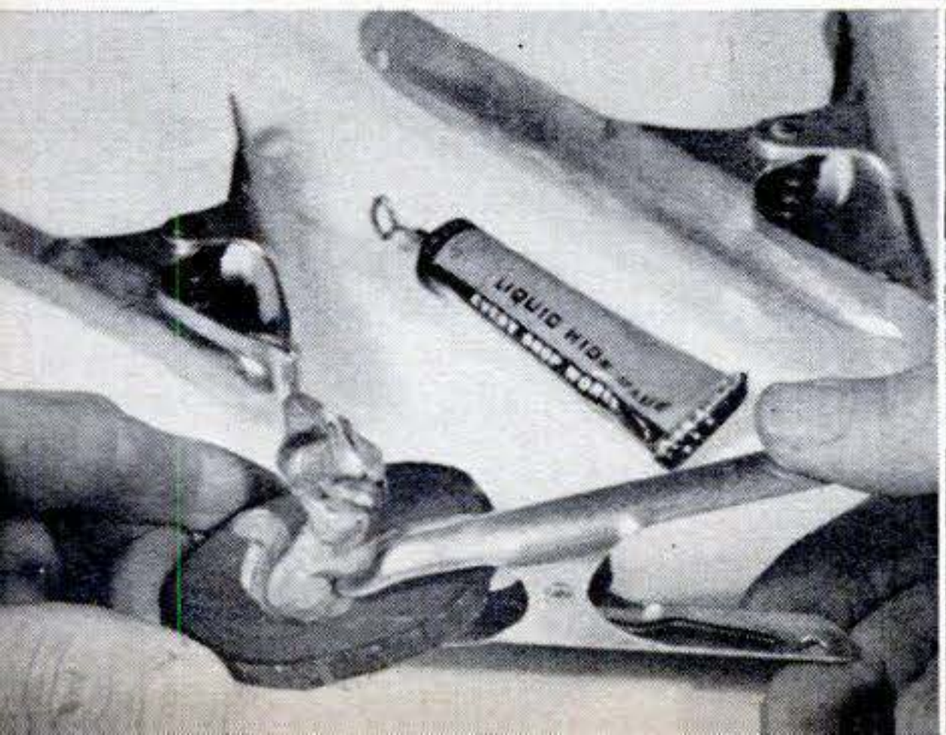


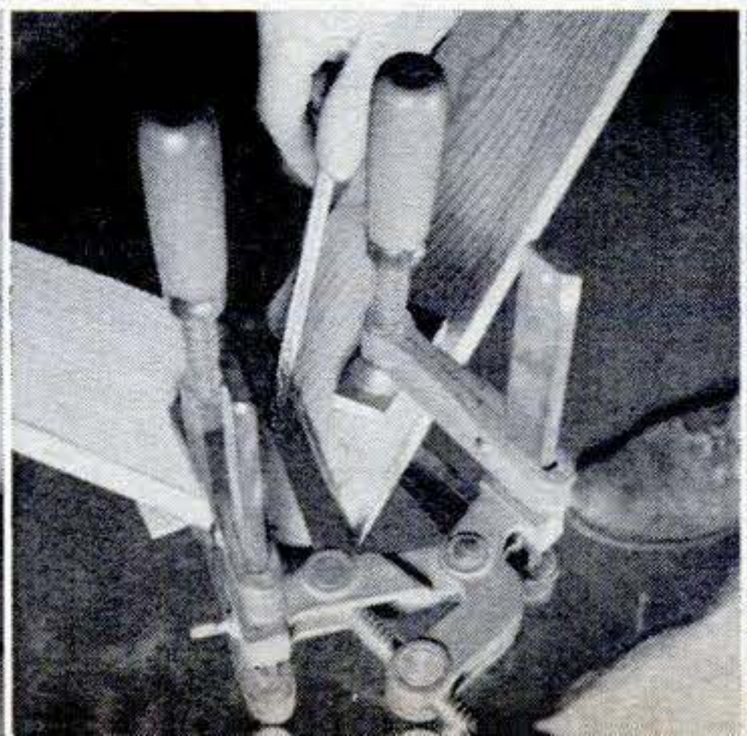
Edge-clamp fixture attaches to short bar clamp for gluing strips to board edges. Bar clamps are screwed tightly on board, and edge clamp then applies pressure against the edge of the board. Wood strip along edge equalizes pressure.

Spring clamp is best suited to light assembly work. Its chief advantage is that it can be put on with one hand while other holds the parts. These overgrown clothespins are also good for small veneering jobs and border-inlay work.

Universal clamp is a real tricky gadget. You can place it on a fitted miter joint, open joint by twisting center handle, apply glue and then bring miter tightly together again to set. It's almost like having a second pair of hands.

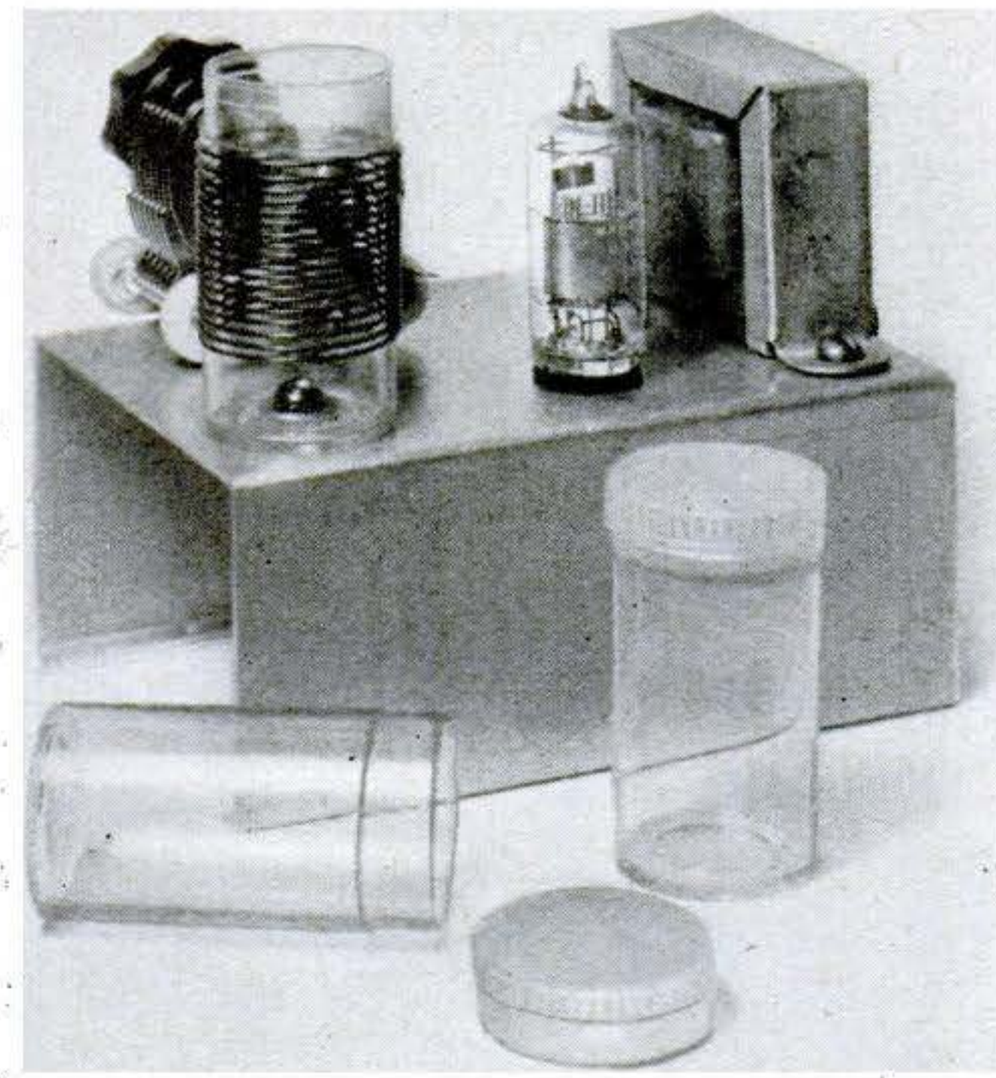
Press screw is heart of many special gluing presses. Four or more can be made into a press for veneering panels. Here one is used to cement linoleum to wood for making block prints. Pressure is vertical, work won't slide. END





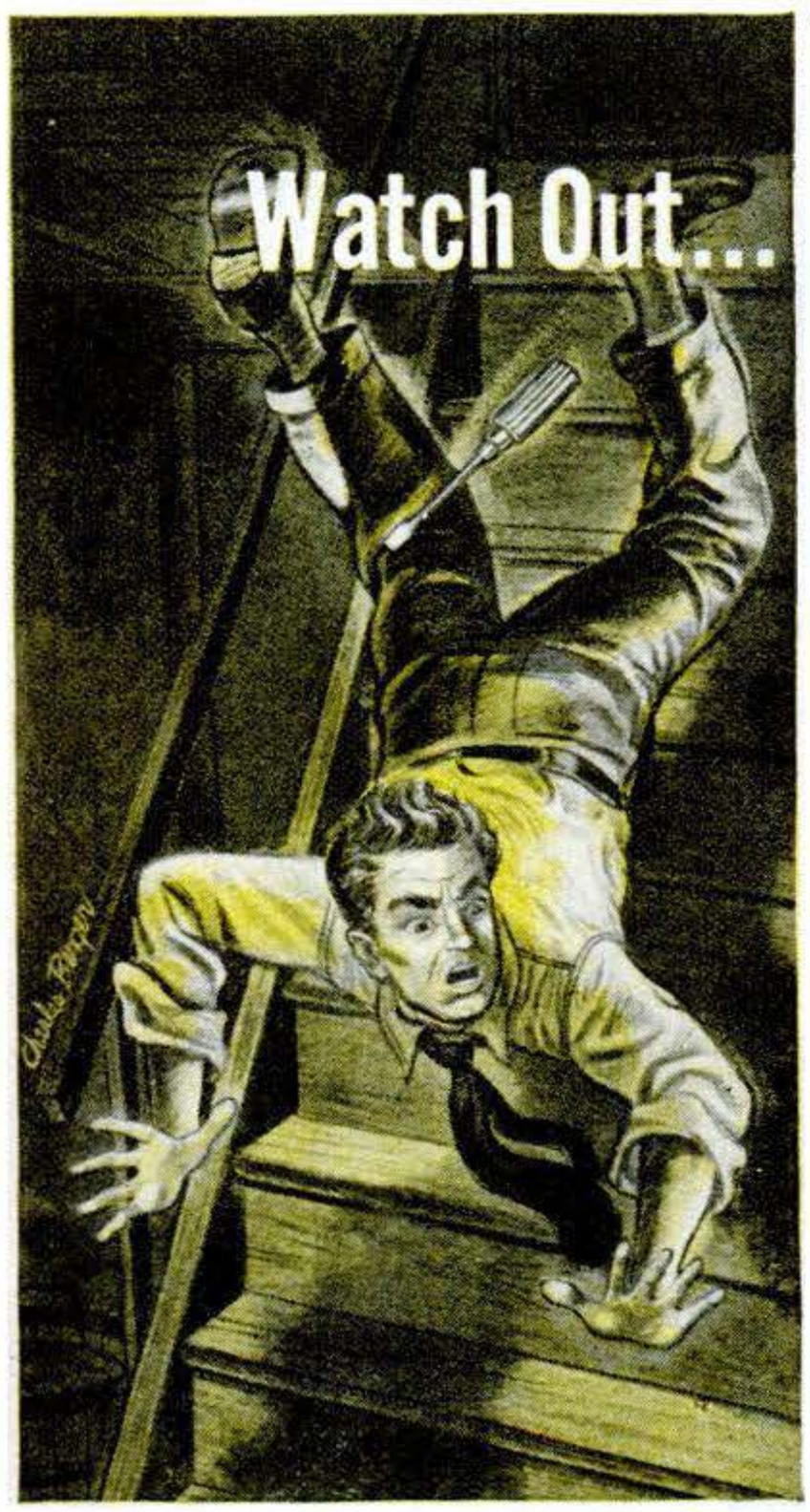
Makes Own Gasoline Tank

Two 50-gal. oil drums were welded together by Melan Arnold of Steuben County, Ind., to form this 100-gal. gasoline tank for his farm. The angle-iron legs and cross braces were salvaged from an old windmill tower.—*A. E. Holden, Angola, Ind.*



Coils Wrapped on Bottles

ALL-PLASTIC pill containers, available at most drugstores, make swell coil forms for UHF radio equipment. Those pictured here cost about three cents each. You can mount them on a chassis by drilling holes in the bottoms for machine screws.



in JANUARY for dangerous falls. Only auto accidents kill more people each year than do falls. January is usually the peak month for tumbles at home. But not, as you might expect, because of ice. Two-thirds are indoors.

IN THE steel industry, once plagued with falls, a man today can expect to work a lifetime and never take a spill. Steel's prevention methods can be used in your home. You will virtually eliminate falls at home if you take time to **(1) keep loose objects off stairs and away from middle of floor; (2) tack down linoleum or rugs; (3) keep light cords near baseboards; (4) install bright lights in dark rooms; (5) keep furniture near walls—not in center of room; (6) climb on step stools or ladders, not chairs, and (7) put handrails on stairs and over bathtub.**

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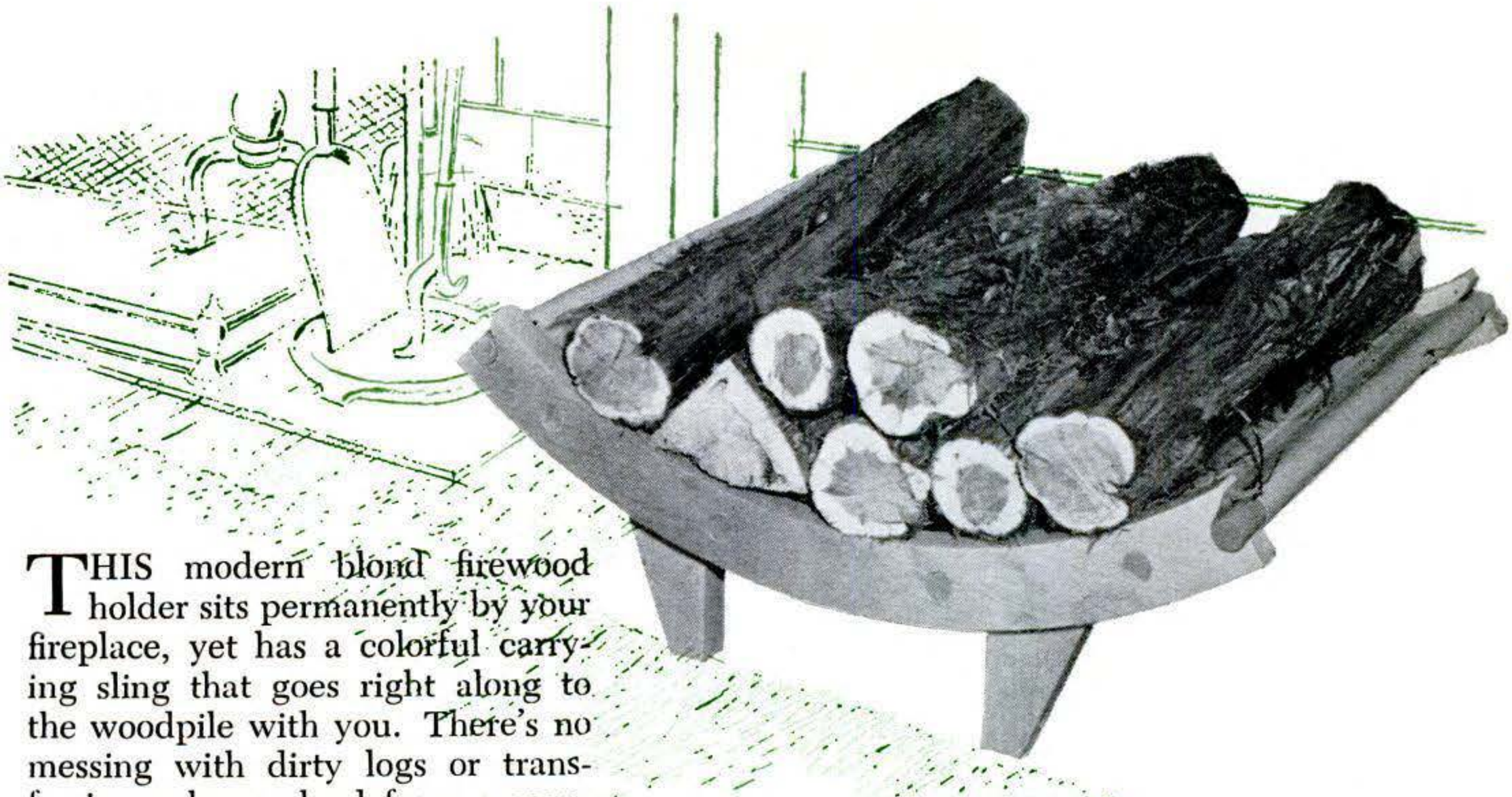


Modern Woodbox Has Lift-Out Sling

A handsome fireplace ornament, it also serves as a carrier to help you lug in a new load of logs.

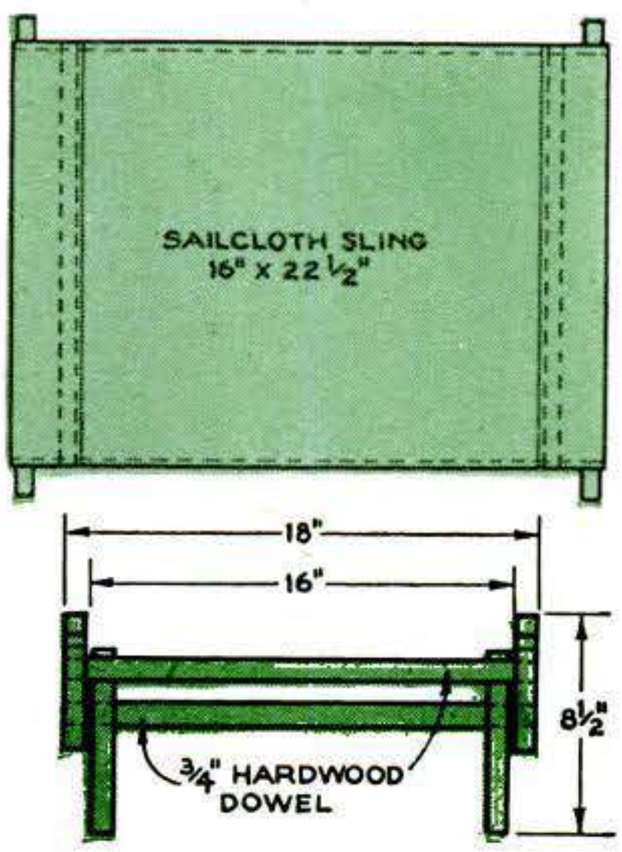
THIS modern blond firewood holder sits permanently by your fireplace, yet has a colorful carrying sling that goes right along to the woodpile with you. There's no messing with dirty logs or transferring a heavy load from a separate carrier to the woodbox. The holder does both jobs in one. And to clean it, you just shake the dirt and bark chips into the fireplace.

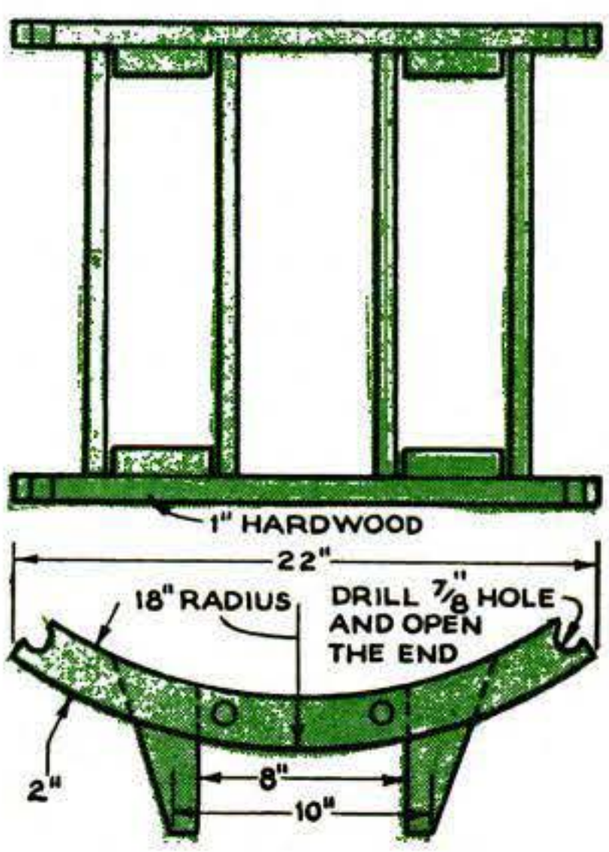
Frame. I made mine out of birch, but any hardwood will do. The two side pieces are a full inch thick, 2″ wide, and curved to an 18″ radius. Drill the ¾″ holes for the dowels and saw the pieces to shape.

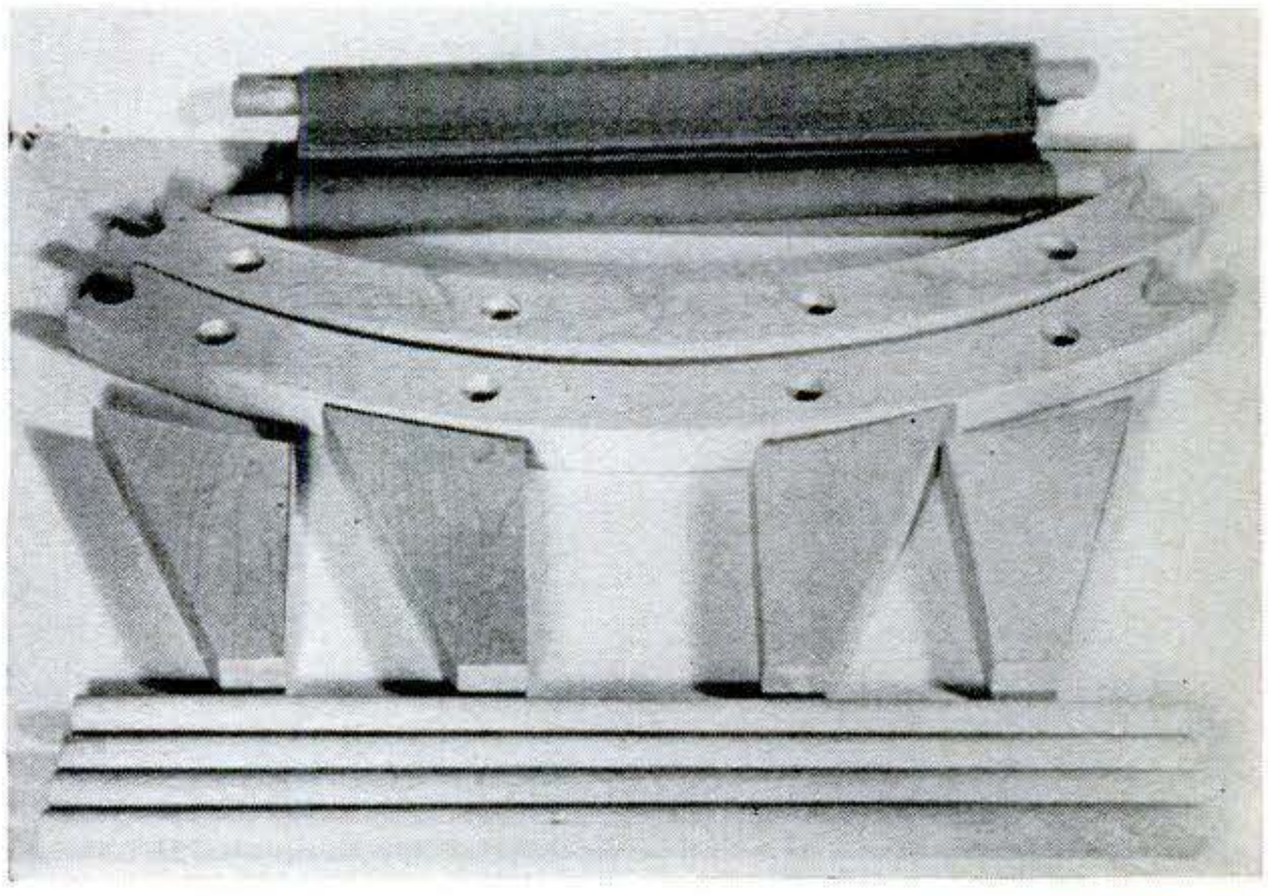
The legs are cut from the same 1″ stock and glued and screwed to the inside of the side pieces. Drill pilot holes for the screws to avoid splitting the wood.

Cut the ¾″ dowels to 18″ lengths and glue them into the side pieces. When dry, sand the entire assembly with very fine paper, apply several coats of clear lacquer, and wax and polish.

Sling. This is a rectangle of brightly colored sailcloth folded double, stitched down both sides, then looped around the removable end dowels and double-stitched. The dowels fit into the notches at either end of the frame to hold the sling in place.—*John Rogers, Dallas.*







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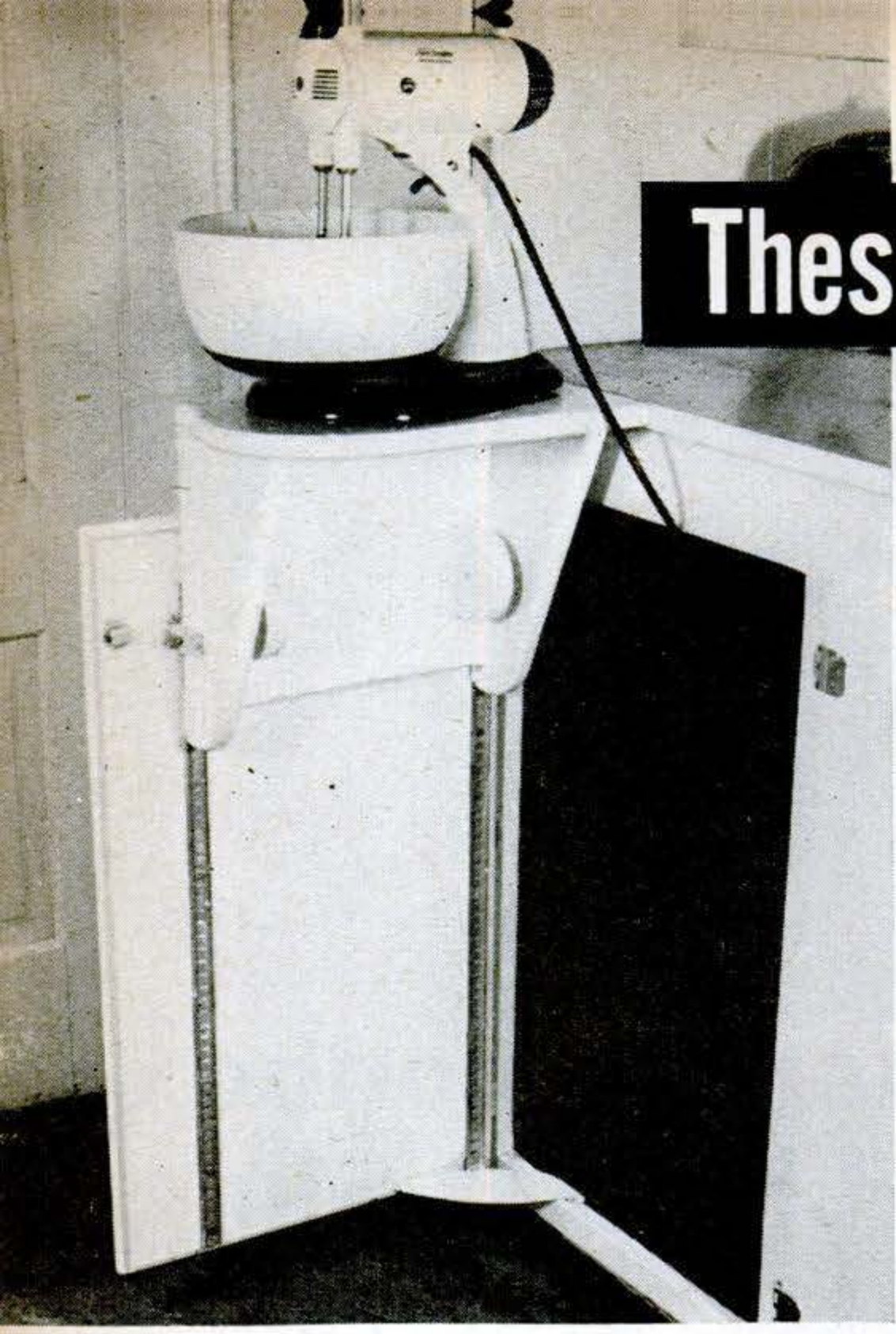
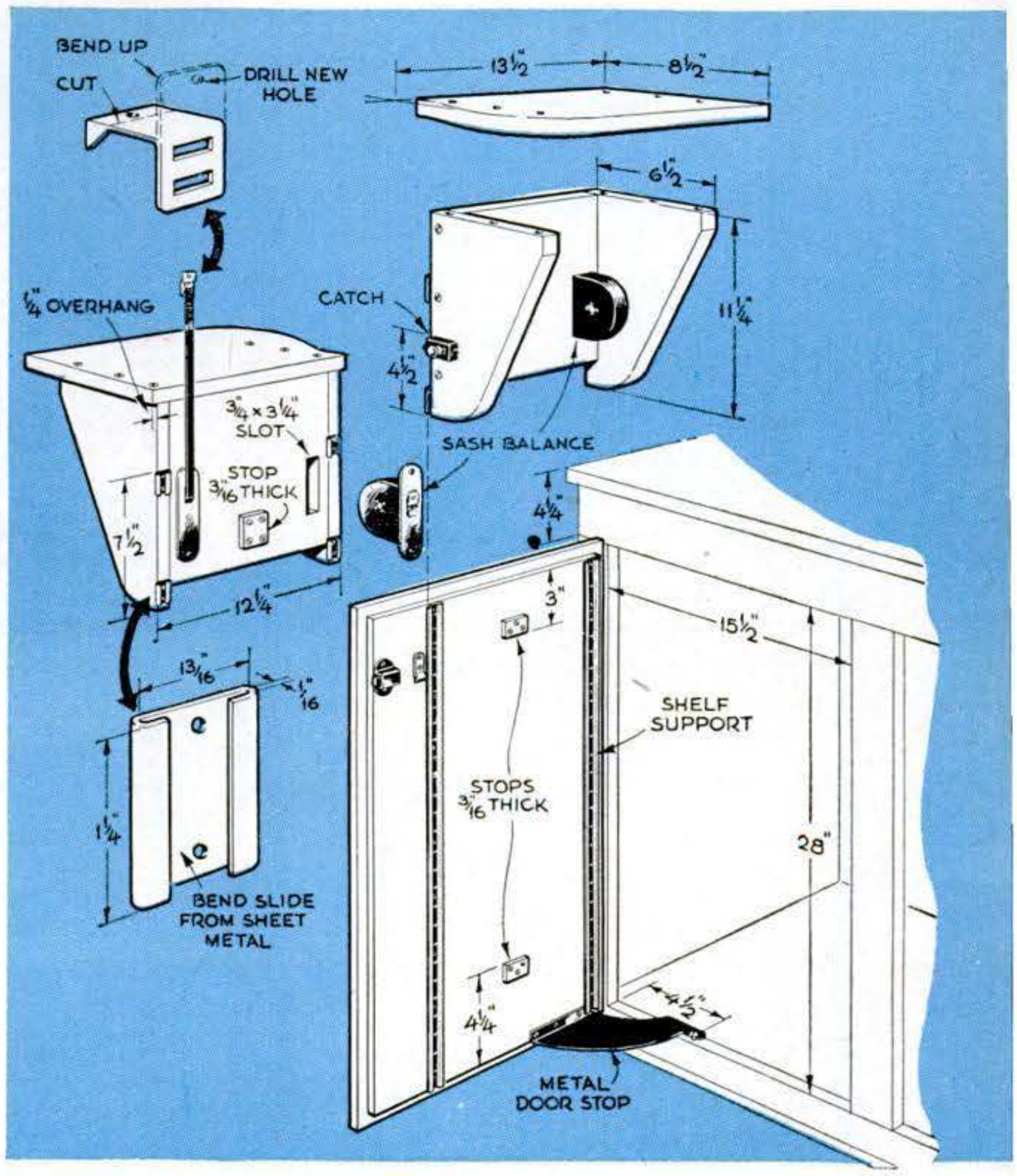
These Ideas Solve Kitchen Problems





Mixer Disappears into Its Cabinet

OPEN the door, pull up this mixer, and it's ready to use. When the job is done, shove down the platform, close the door, and the mixer is safely out of the way until the next time the housewife needs it.

Spring mounted. This solution to the common problem of what to do with the bulky mixer is achieved with two hardware-store items—a pair of spring sash balances and a pair of adjustable-shelf supports. The supports serve as a track for the sliding unit and the balances make it easy to raise and lower. Stops limit the unit's travel and a catch holds it level with the top of the counter. The mixer is permanently plugged into an outlet inside the cabinet.

The sliding unit will fit most standard cabinets. The door opening is the only critical dimension. To accommodate the ordinary mixer, it must be at least 15″ wide and 25″ high.

The shelf unit should be built first, using ¾″ stock. Modify the ends of the sash-balance tapes by cutting off the hook, bending up the end and drilling a new hole. Install the balances in slots cut in the back of the shelf unit.

Track and slides. Bend four slides from heavy sheet metal so they are an easy sliding fit on the shelf-support tracks. Mount them on the back of the shelf unit, spacing them to suit the tracks.

Attach one track to the hinge side of the cabinet door so that when the door is open the mixer shelf will fit up snug against the counter top. Then position and align the other track. Locate the lower stop on the door so that the mixer unit will clear the door casing. After attaching the tape ends to the upper part of the door, screw the upper stop in place. A stop to hold the door open while the mixer is up can be cut and bent from sheet metal. Screw the mixer base to the shelf.—*Keith Heryford, Cedarville, Calif.*

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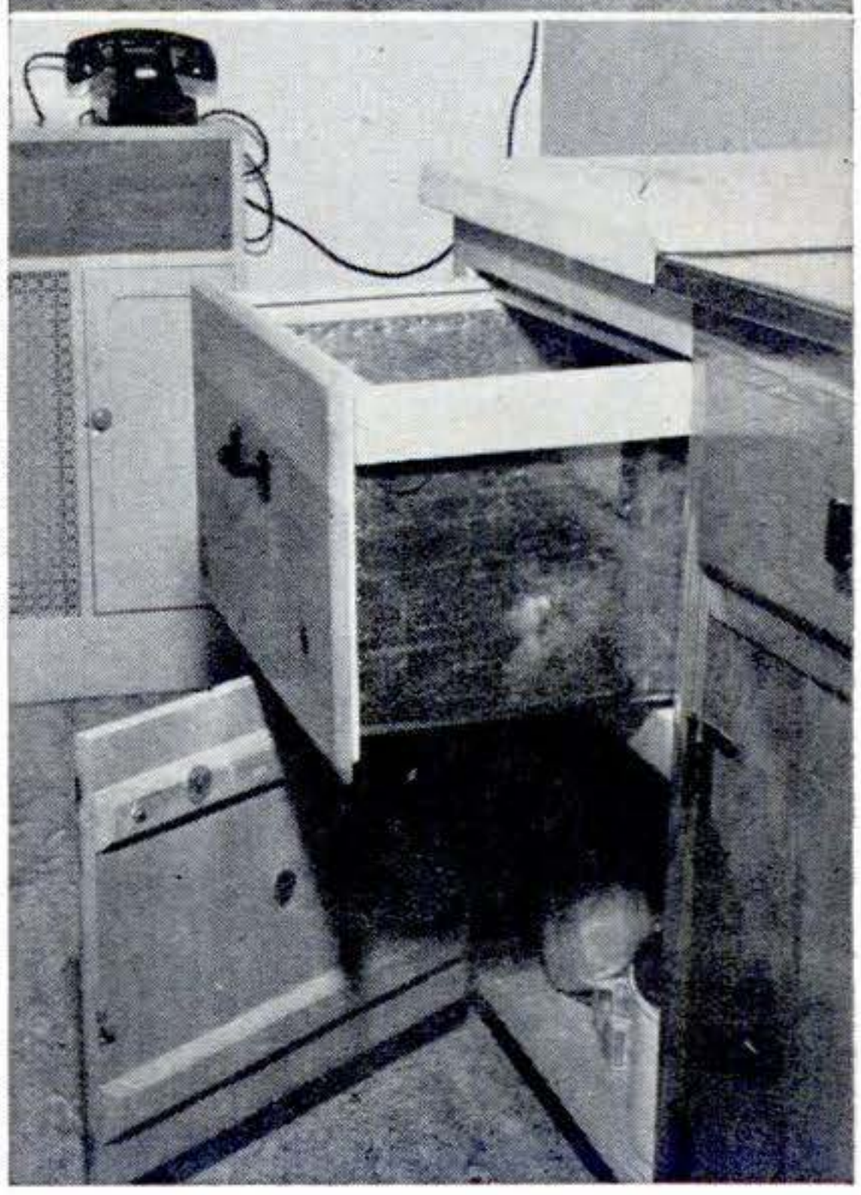
Chopping-Block Cabinet Has Built-In Breadbox

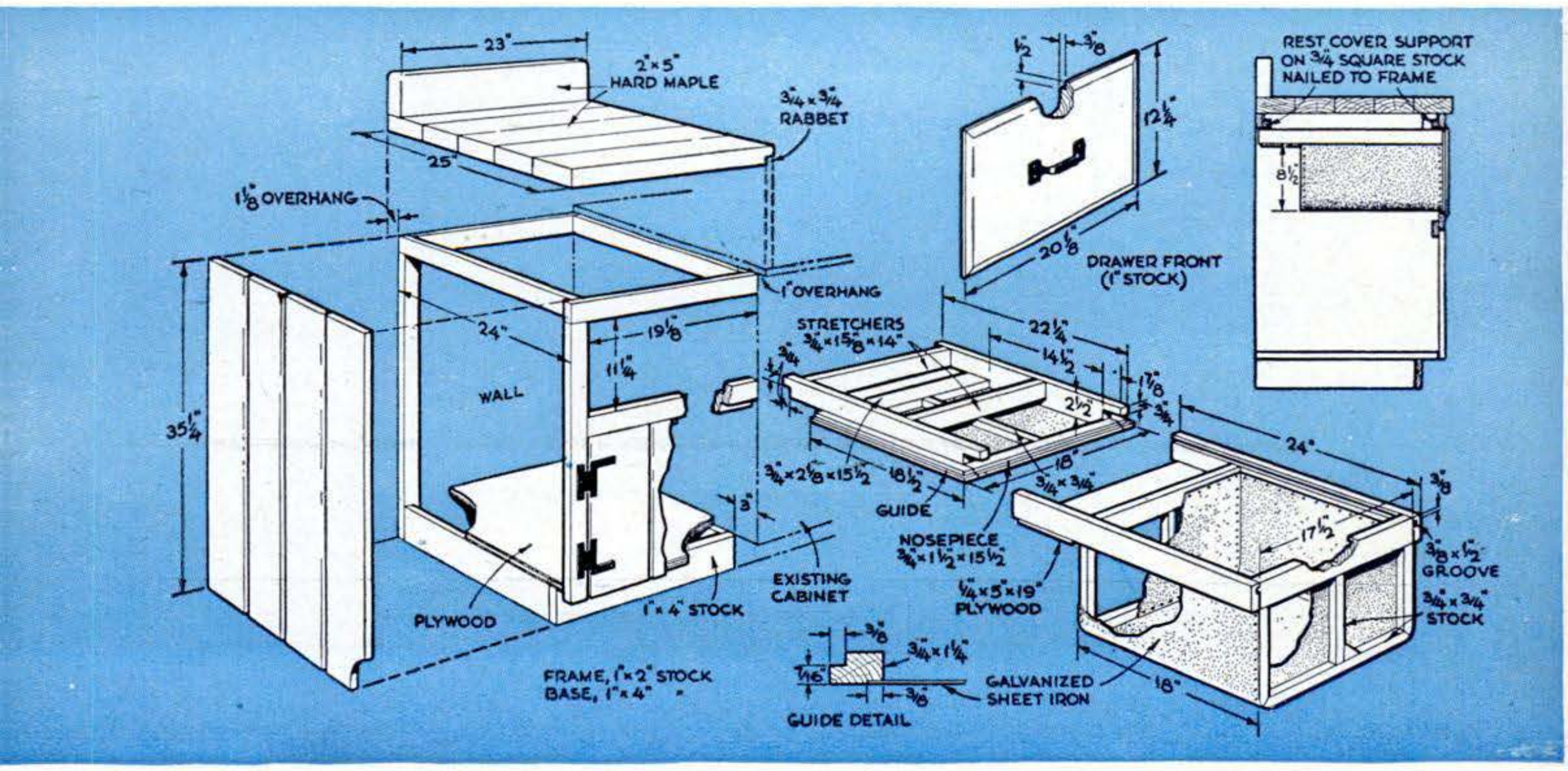
FEW cabinets can qualify for three kitchen jobs—but this one does. Its hard-maple counter is a handy cutting board. It keeps bread fresh in a metal pull-out box. And it stores a lot of equipment on its four square feet of space behind the door. Material was conserved in its construction by nailing framing members to the wall and the end of an existing cabinet. The end was covered with 1″ pine boards, recessed behind the vertical facing strip, and the door was made of the same stock held together by two battens.

Maple top. For the top, 2″ by 5″ hard maple, dressed four sides, was glued up and then trimmed to size. A ¾″ by ¾″ rabbet cut along one edge allows the top to rest firmly on the adjoining counter.

The drawer was begun by building the end frames and covering their inner faces with light-gauge galvanized sheet, attached with blued gimp tacks. An 18″ by 27½″ piece of galvanized sheet was then pre-bent with 1″ dowels to conform to the curvature of the bottom corners of the frame and also tacked in place. Addition of the grooved runners completed the box.

Covered drawer. The drawer-guide assembly also was covered with galvanized sheet on the lower face. Thus, the breadbox has a built-in cover. This assembly was installed in the cabinet by resting the supports on ¾″-square stock nailed to the front and rear cabinet frame. The maple top was then attached with long wood screws driven upward through the horizontal face strip in front and ¾″-square strip at the rear.—*Stanley Lehrer, Pompton Lakes, N. J.*





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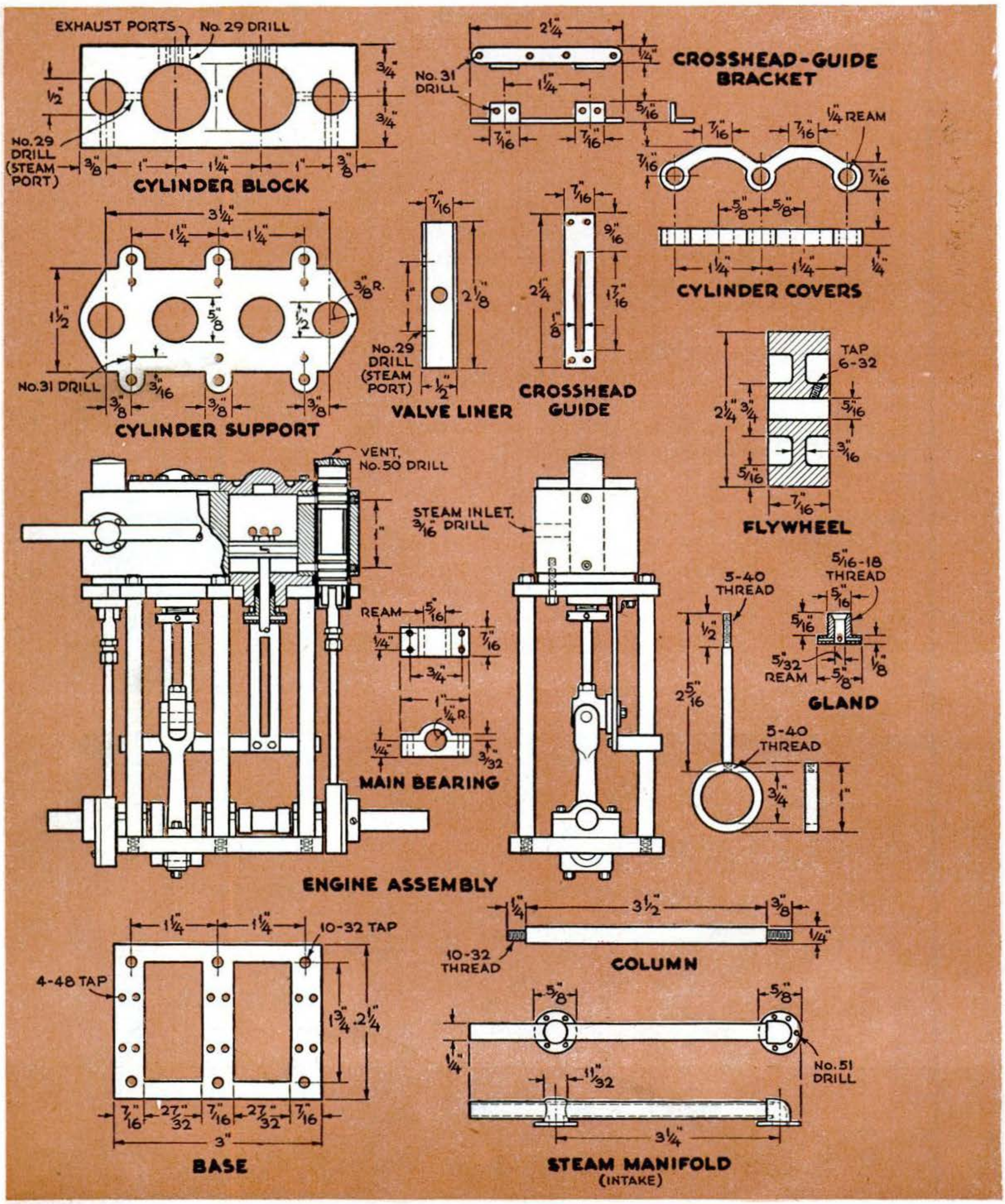
Model Marine Engine Requires No Castings



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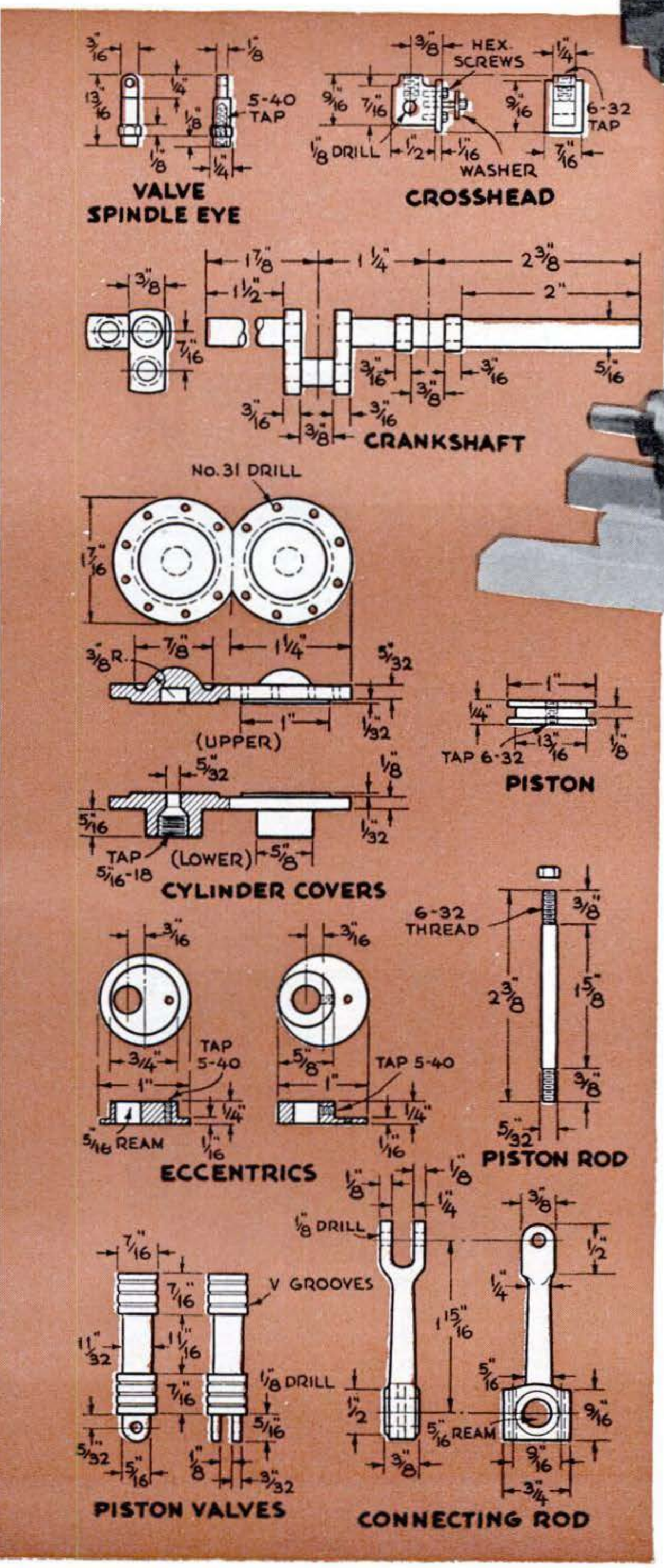
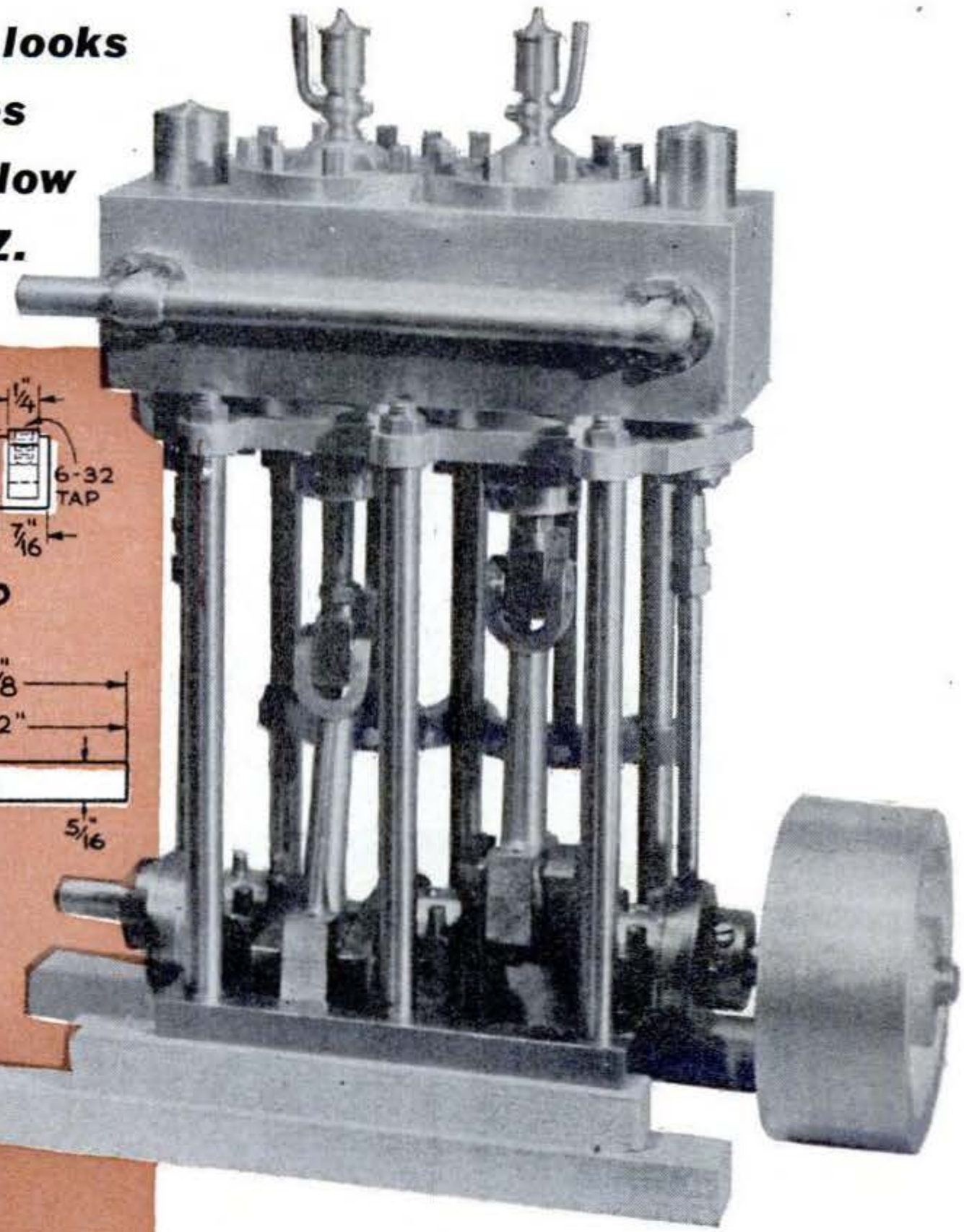
Building this power plant looks tricky, but it is just a series of simple operations. Follow them in photos from A to Z.





By C. W. Woodson

ALTHOUGH the little two-cylinder steam engine above has been simplified for easy construction, this does not show in performance or looks. The model has two double-acting cylinders with inside-admission piston valves. Bore is 1″ and stroke ⅞″. Steam is exhausted through ports drilled in the cylinder walls, greatly simplifying the valve gear.

Reverse gear has been omitted for simplicity, but the engine can be made to run in either direction by resetting the eccentrics. Slip-eccentric reversing could be added easily.

With 75 lb. of steam or air the engine will kick over at about 1,100 r.p.m., providing ample power for a 48″ to 60″ model boat.

All parts are machined from scrap-bin pieces of brass, bronze, dural and steel. After the final assembly, pour a bit of water-diluted Noxon silver polish into the cylinders and valve liners and rotate the crankshaft by hand to lap the moving parts to a smooth fit. Then wash the polish out, oil all parts, and full steam ahead!

Please turn the page for A-to-Z photos.

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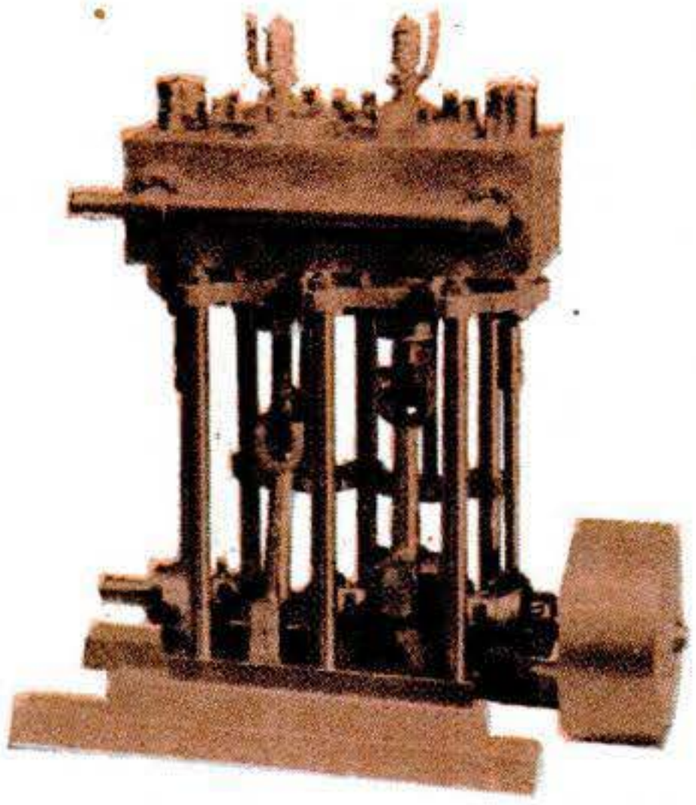
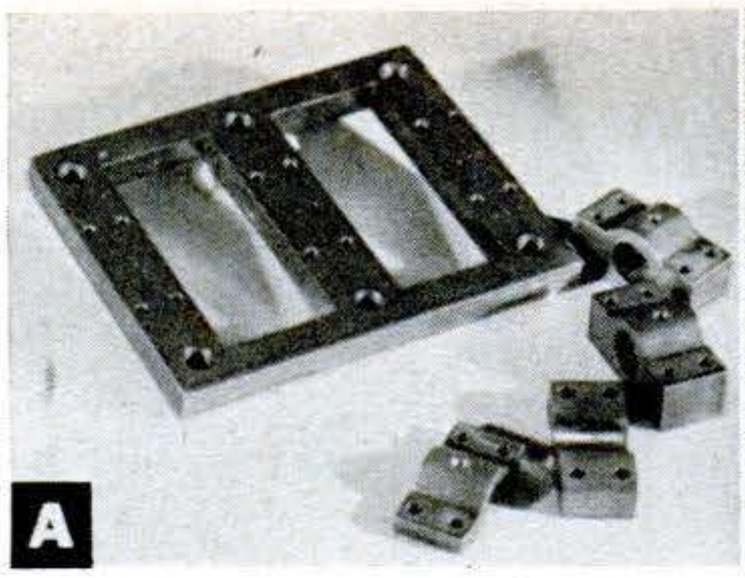
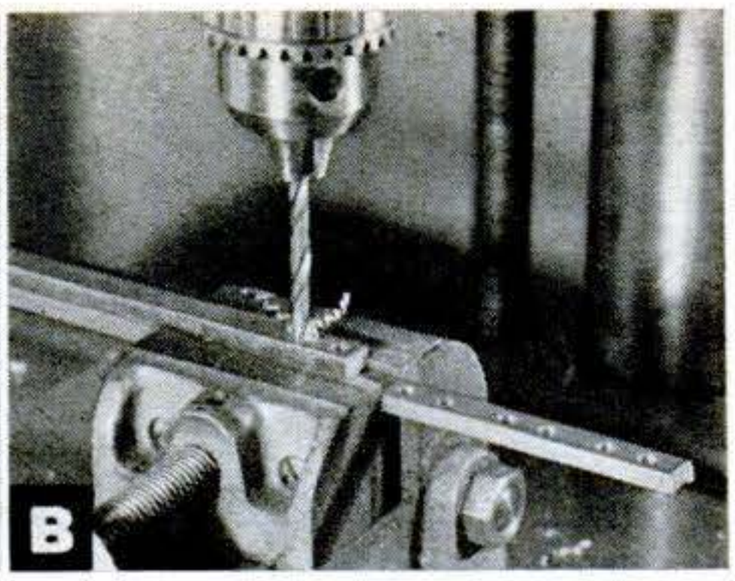


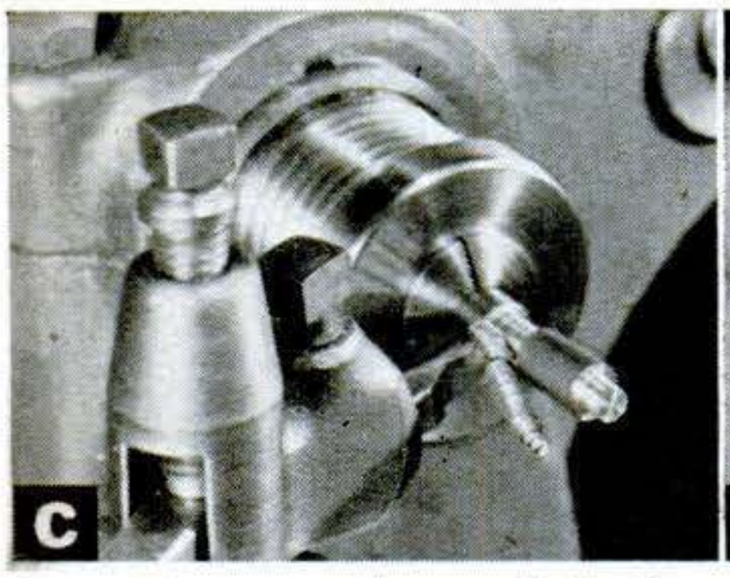
Here are the 26 steps in the construction of the engine.



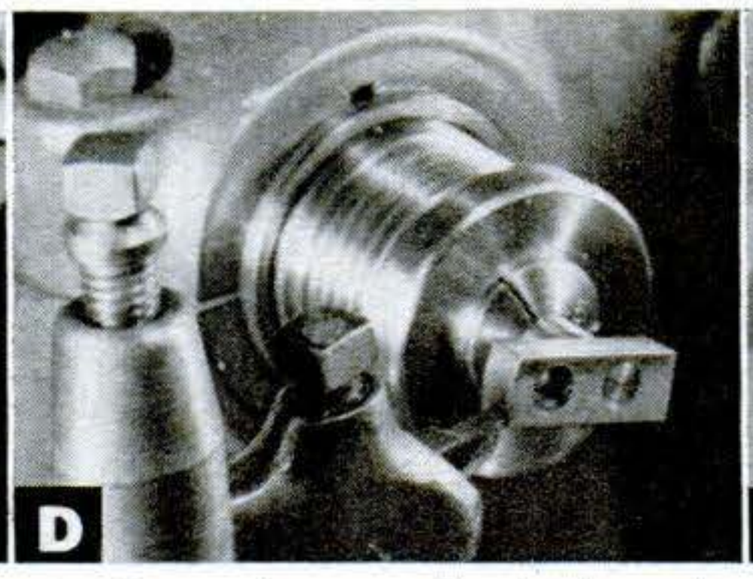
Base and main bearings. Brass base plate, ¼" thick, is cut out for two crankcase wells. Large holes, tapped 10-32, are for supporting columns; small holes, tapped 4-48, are for bearings. Main bearings are two pieces of ¼" brass soldered together for machining, then unsoldered to form upper and lower sections.



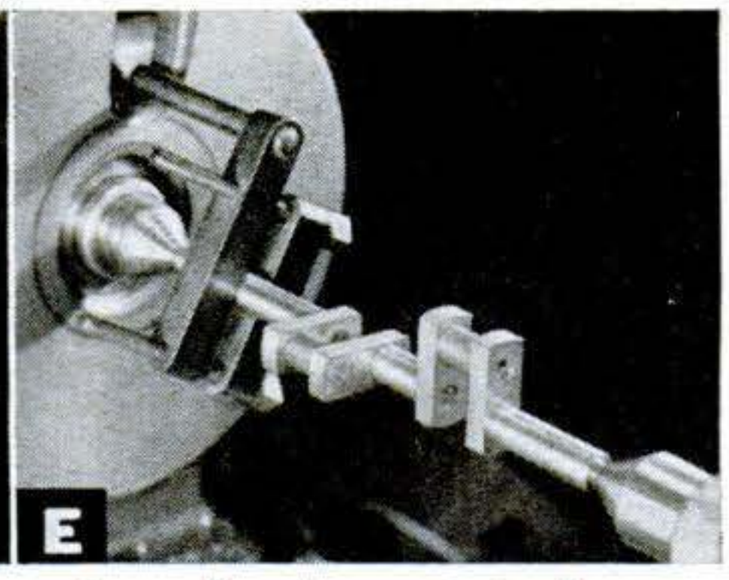
Crankshaft webs are cut from steel bar stock, 3/16" by ⅜". Shaft holes are drilled 7/16" apart, using jig to assure uniform spacing. After drilling, the webs are cut off, stacked in a drill-press vise and reamed to make absolutely certain holes are spaced right. Ends of webs are machined later in the lathe.



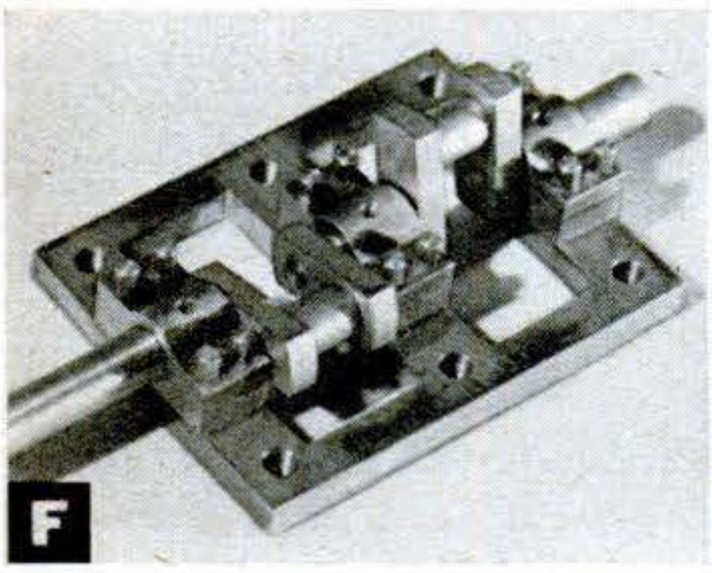
Crankpins and crankshaft ends are made from 5/16" drill rod. Turn both ends of the pins and the inner end of the shaft sections .002" oversize for a force fit in the 3/16" reamed holes in the webs. As no truing cut is made on the crankpin surfaces, the drill rod should be held in a collet or indicated true.



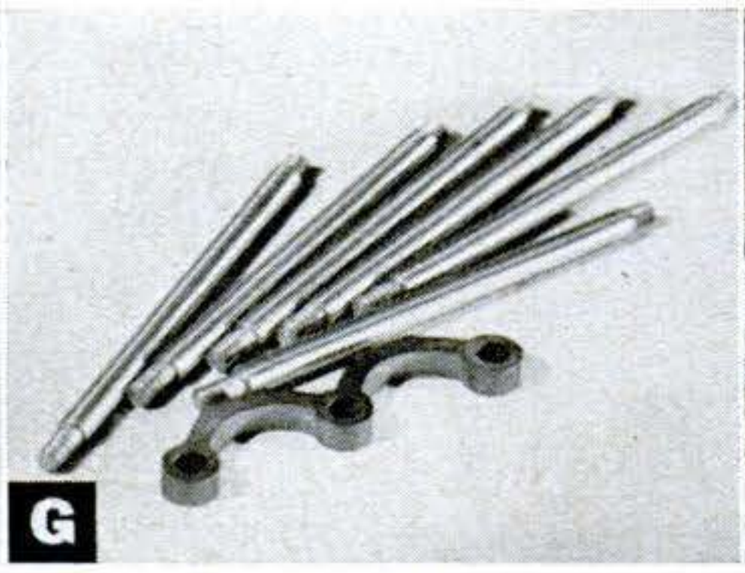
Web ends are finished and brought to dimension in the lathe. As each web is forced onto a shaft or crankpin section, it is chucked and turned to an 11/16" radius from the center of the far hole. It is not necessary to pin the force-fitted webs to the shaft, but driving pins in undersize holes is extra insurance.



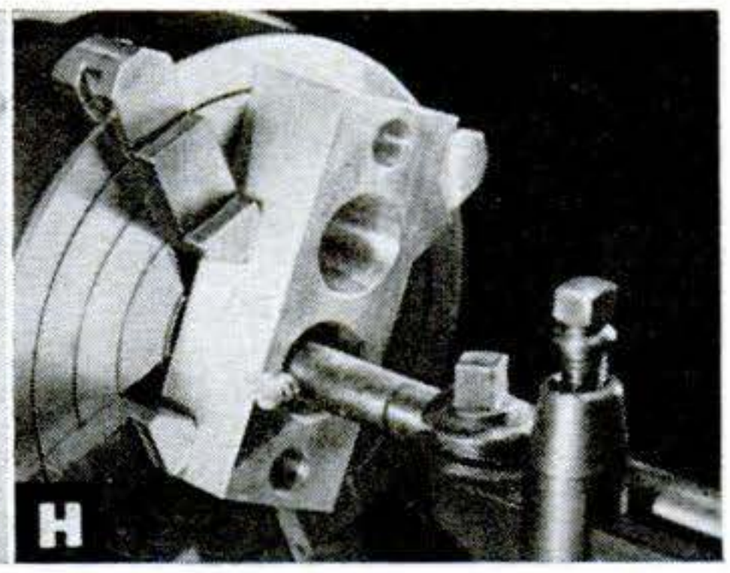
Completed crankshaft is set up between centers and tested for accurate alignment. Crankpins are set at 90°, giving shaft a smooth-running quality with four evenly spaced impulses to each revolution. This allows it to run without a flywheel, although performance is improved if one is used. Chances of stalling are also lessened.



All set up. Prior to installing crankshaft, main bearings are aligned by slipping them on a straight piece of 5/16" drill rod and clamping in position. Holes are then drilled in base for mounting screws. All hex-head screws are turned from ⅛" steel hexagon rod and threaded 4-48. Corners of hex heads are rounded and polished.



Crosshead-guide support, shown with columns, is cut from ¼" brass plate. Three holes are drilled first, using the base as a spacing jig, and then layout of shape is made, using holes as reference points. Columns are ¼" drill rod cut to length, shouldered for ¼" at bottom, ⅜" at top and threaded 10-32 at both ends.



Cylinder block is solid chunk of brass or bronze. Lay out centers for cylinders and valve-insert holes and bore out 1"-dia. cylinders in lathe. Make final pass with a honed, round-nose boring bit fed slowly for maximum smoothness. Cylinder is lapped with Noxon silver polish after assembly, then washed and oiled.

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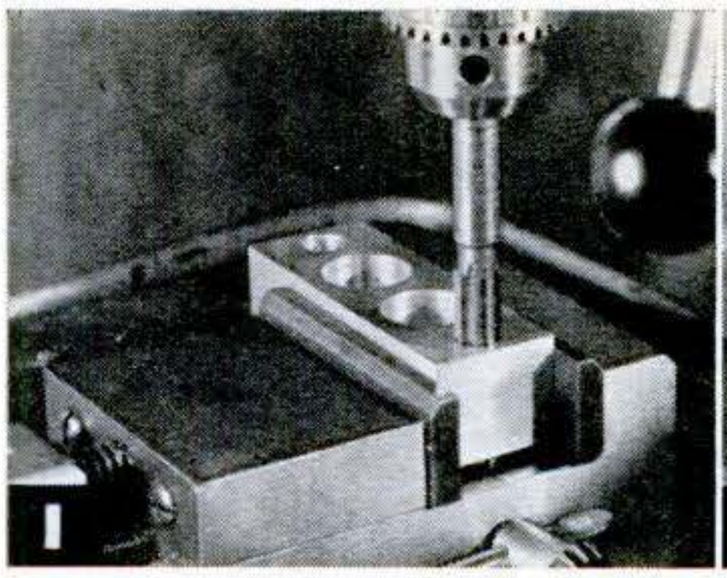
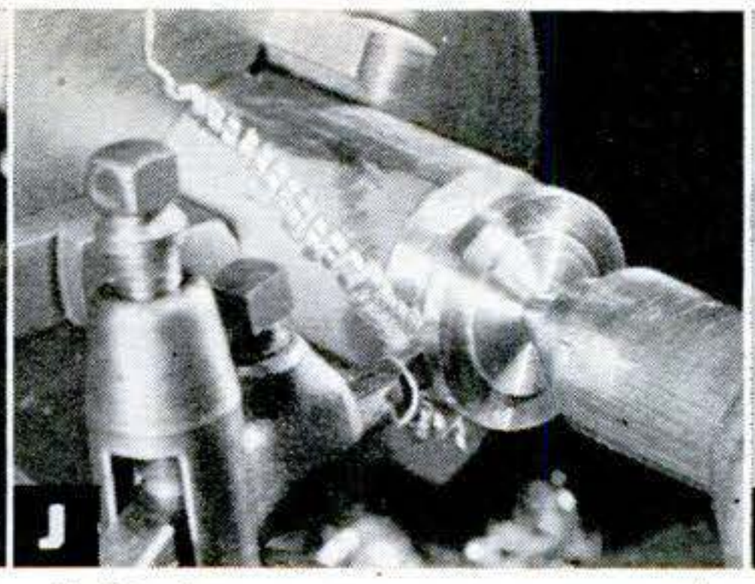
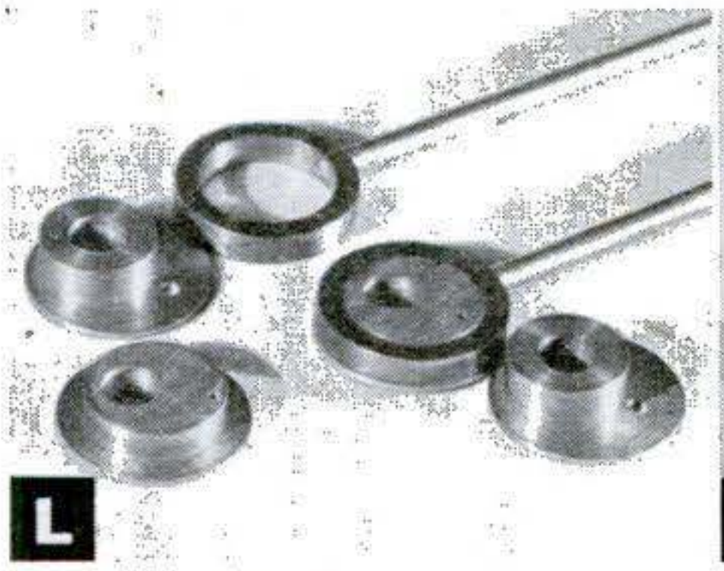


Valve-insert holes are reamed ½". Intake and exhaust ports are drilled. Valve liners—½" brass tubing—are drilled in one wall. Liners are then turned 180° to line up holes with ports and locked with setscrews in block end. Steam-inlet holes are drilled through block and one wall of liner from front of block.

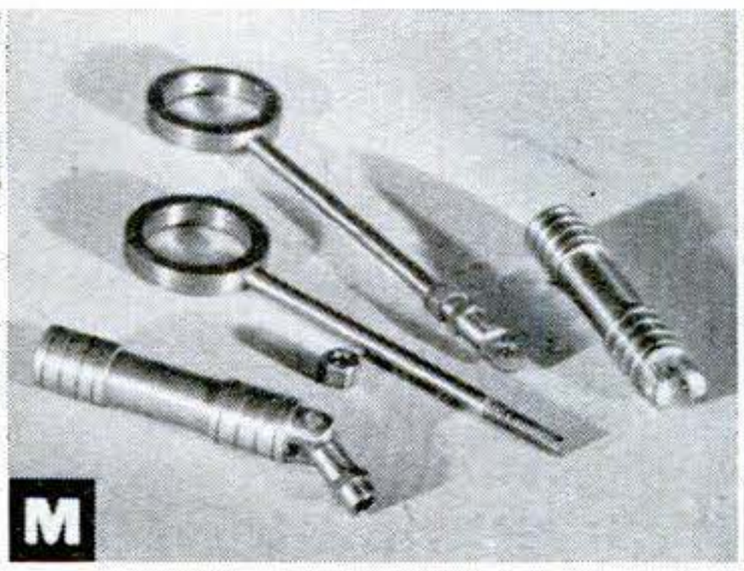


Cylinder covers are turned from 1½" brass rod. Inside face of upper and lower covers are turned to a snap fit in cylinder bore, using cylinder as gauge. Then they are cut off, reversed in the chuck and finished. Piston-rod packing-gland hole should be drilled and tapped in lower cover before cutting off.

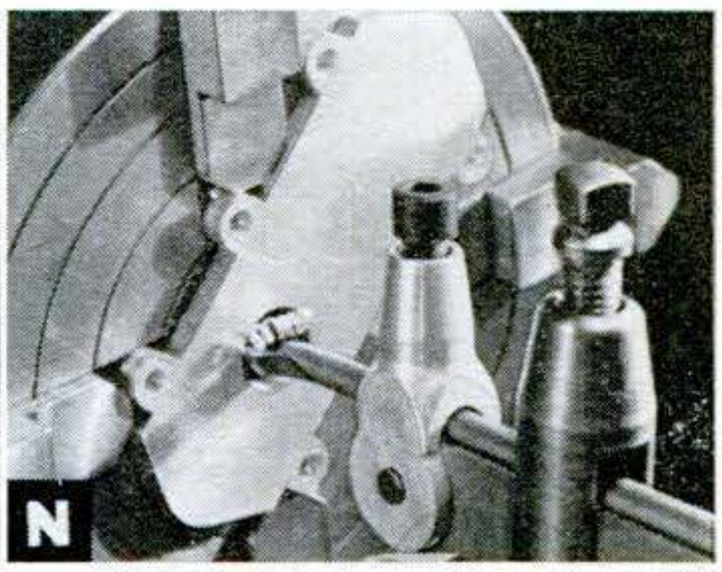
Packing glands (at right in photo above), are turned from ⅝" brass rod and threaded to fit lower cylinder cover. Gland is drilled and reamed 5/32" for piston rod and upper end of hole is counterbored for packing. Four 1/16" holes in flange are for adjusting pin to tighten flange on graphite packing.



Valve eccentrics are made in two parts and joined by a single setscrew. The body or bearing was turned in the three-jaw chuck; the cover plate with off-center collar, in four-jaw chuck. The collar is drilled in the lathe, then used as a jig to locate the hole in the body. Straps are thick-wall tubing of proper inside diameter.



Piston valves, turned from mild steel, should be perfect fit in valve liners. Oil grooves are cut with V-shaped cutter bit. Lower ends are slotted and drilled for adjusting eyes, which are threaded onto eccentric rod and held in proper adjustment by lock nuts. Rods are threaded into eccentric straps.

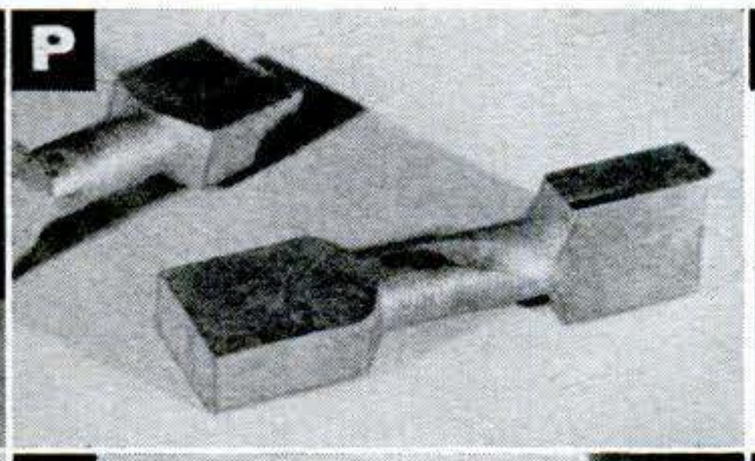


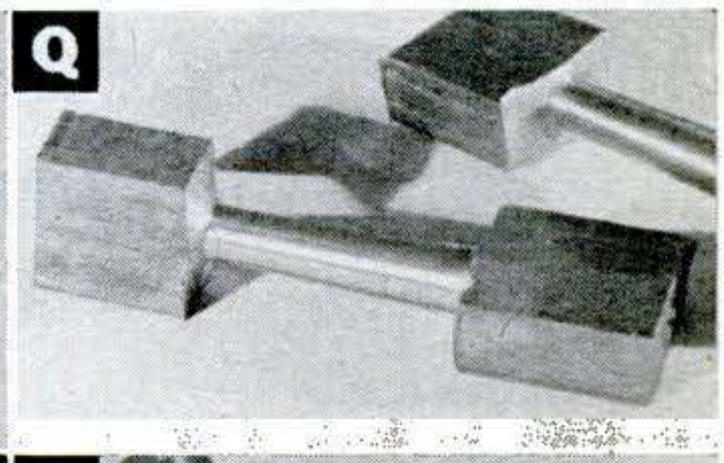
Cylinder-block support is cut from 3/16" brass plate. Holes for supporting columns must match those in base. Support is chucked in lathe and bored to receive the ⅝" collars of the lower cylinder covers. Six No. 38 holes for the screws that join plate to underside of block are then drilled according to the layout.

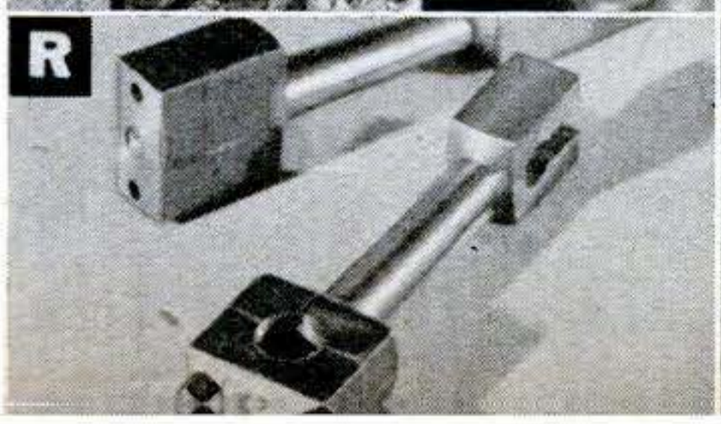
Connecting rods, developed from lengths of steel bar stock, are made in successive stages: (O) The steel bar is centered in the four-jaw chuck, centerdrilled at the free end, and supported by the tailstock center while the middle section is rough-turned. (P) The big end is then clamped in a vise, the rod heated almost white hot and the small end bent at right angles to the big end. (Q) When cool, it is set up in the lathe again and turned to finished size. (R) The little end is then cut out and filed to shape and the big end drilled for the two bearing-cap screws. The bearing cap is cut off the big end, the meeting surfaces smoothed, and then joined with the two cap screws.

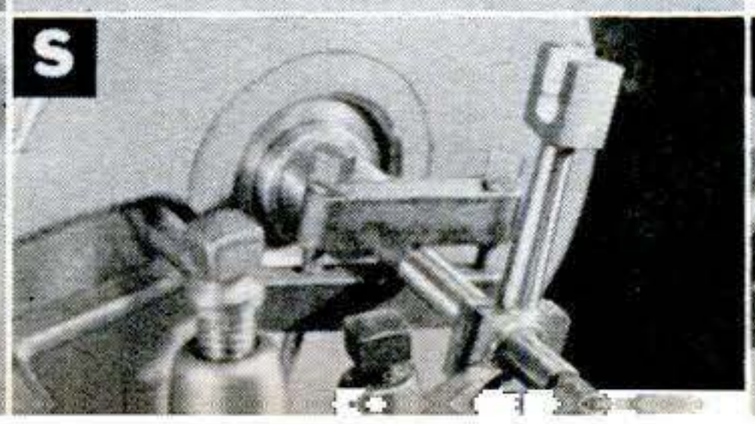
The crankpin hole is then drilled and reamed 5/16". (S) The big end is clamped on a mandrel and turned to shape, and the little end is drilled for a ⅛" rivet that links it to the crosshead. (T) The finished con rod looks like this after machining.

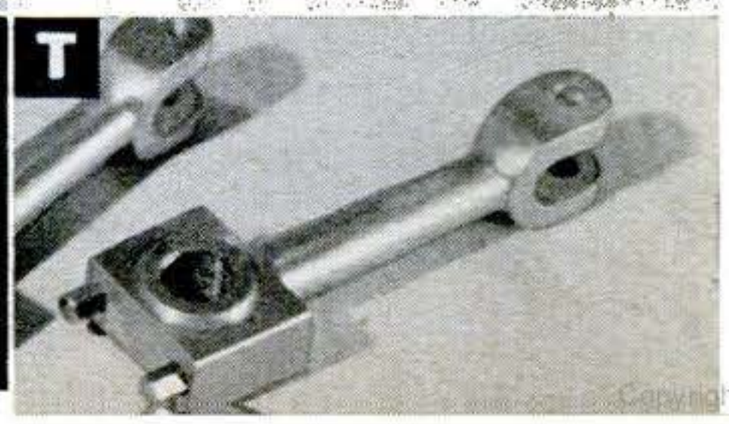
Turn the page for the six final steps.











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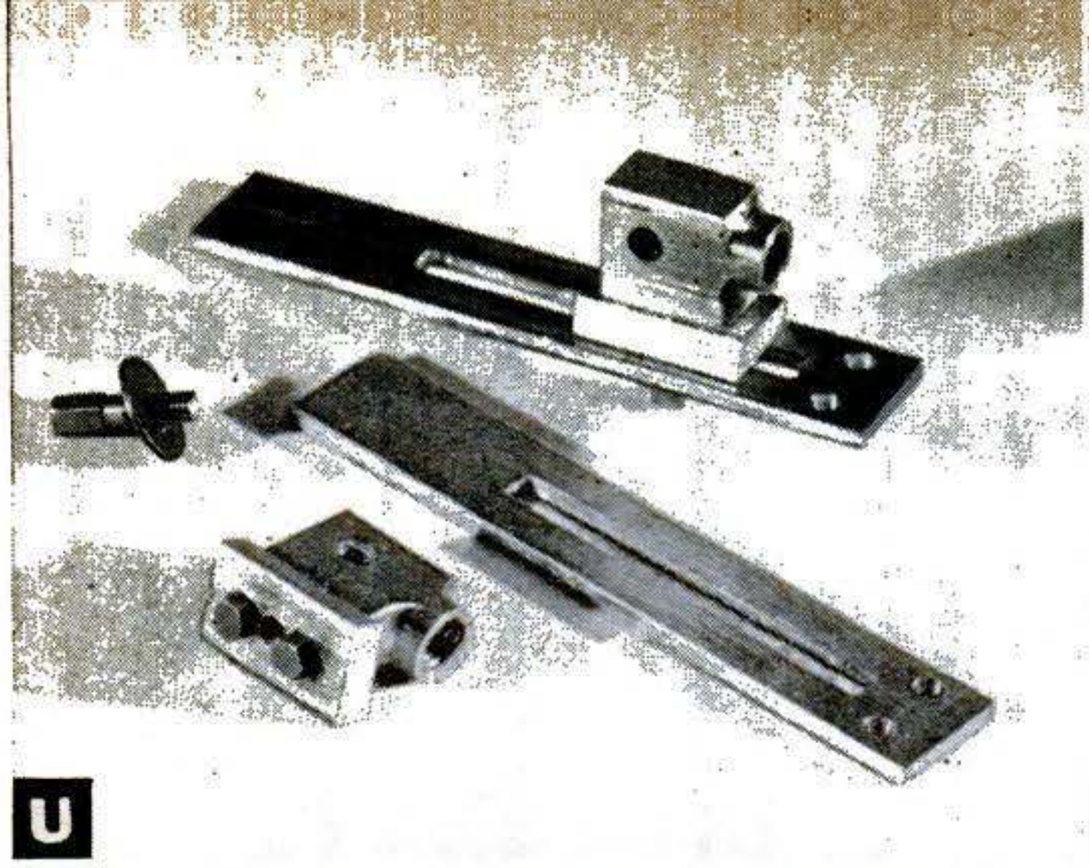
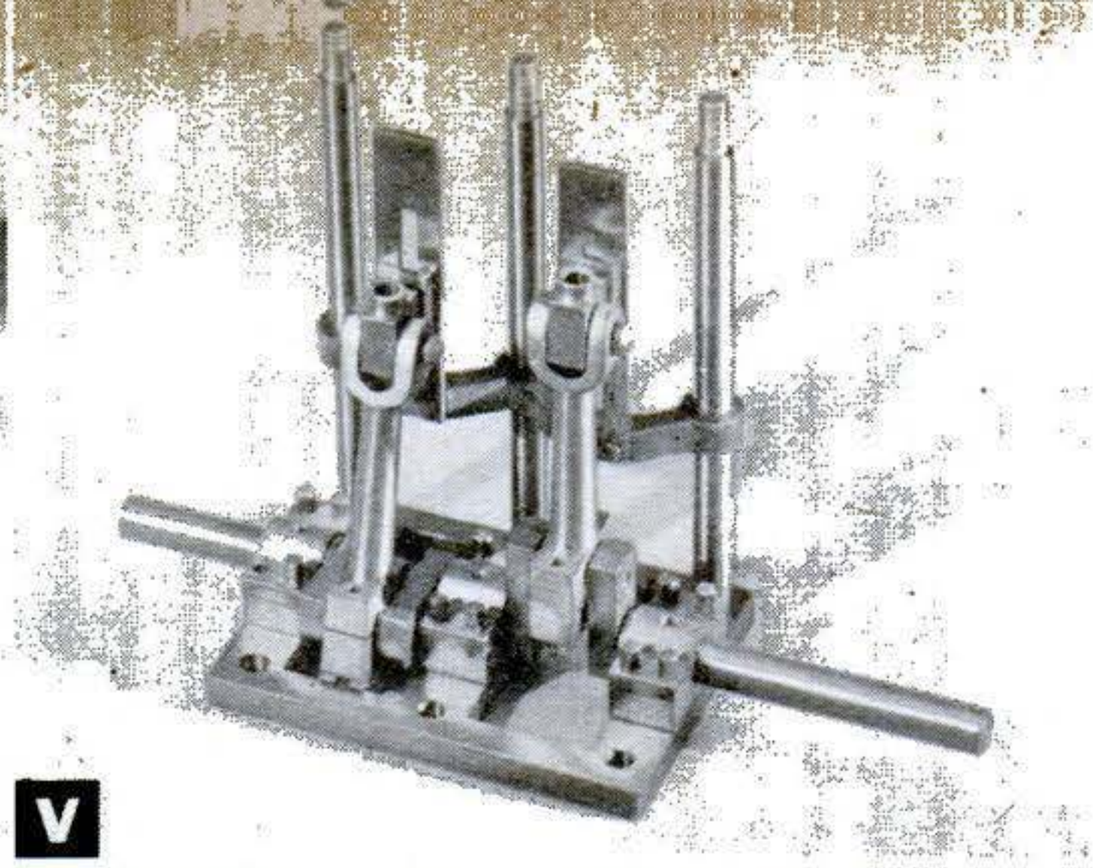


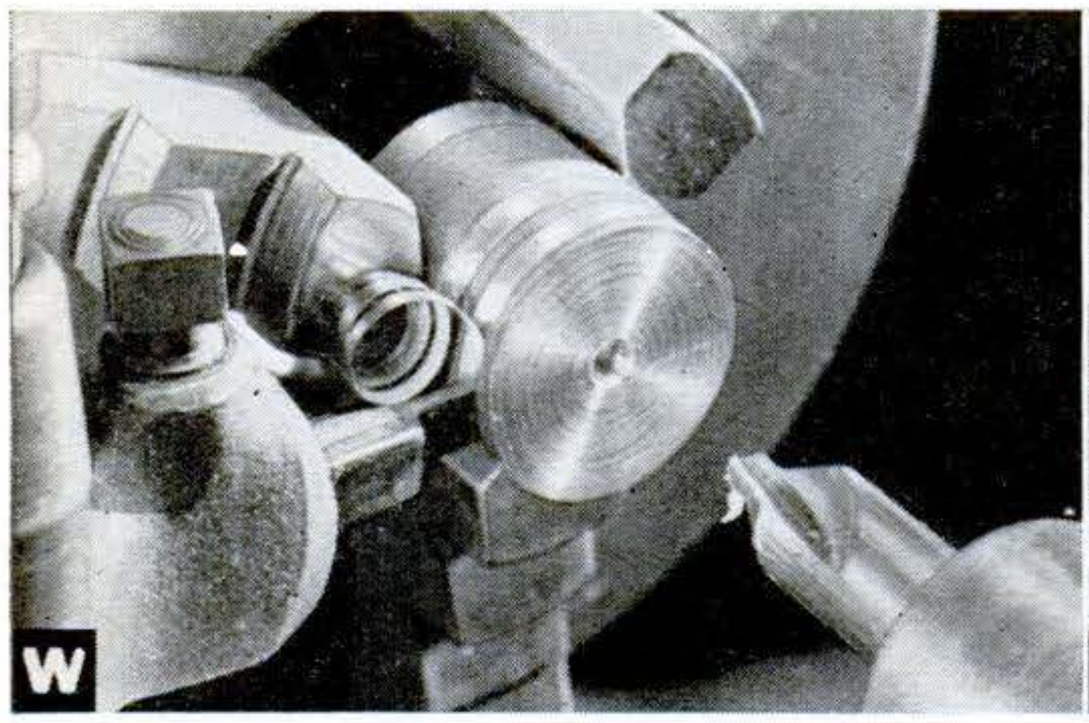
U

Crossheads are shaped from ¼" brass and a slipper of 1/16" brass is soldered on foot. Any error in the crosshead-guide support can be made up by altering the thickness of the slipper plate. The heads of two hex-head screws ride in slotted crosshead guide; setscrew and washer hold assembly together.



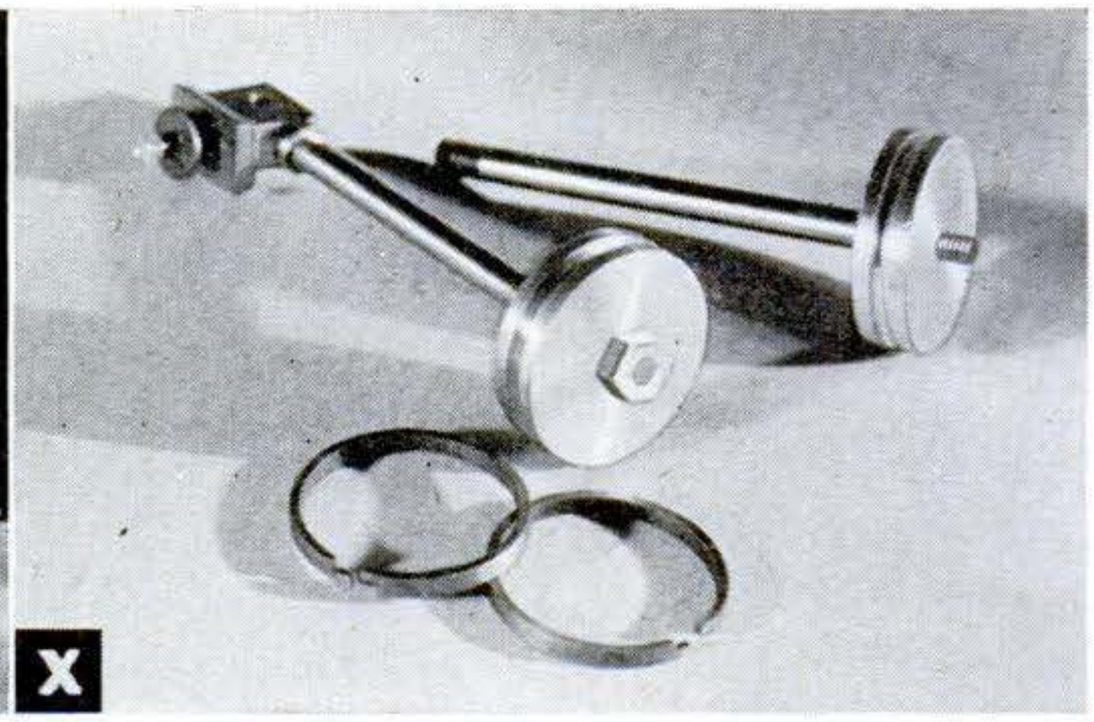
V

Trial setup. Smooth action of moving parts is checked by setting up lower half of engine and rotating crankshaft by hand. Crosshead-guide support should be placed in proper position on columns to check crosshead travel in slot. Upper ends of guides are later supported by bracket on upper assembly.



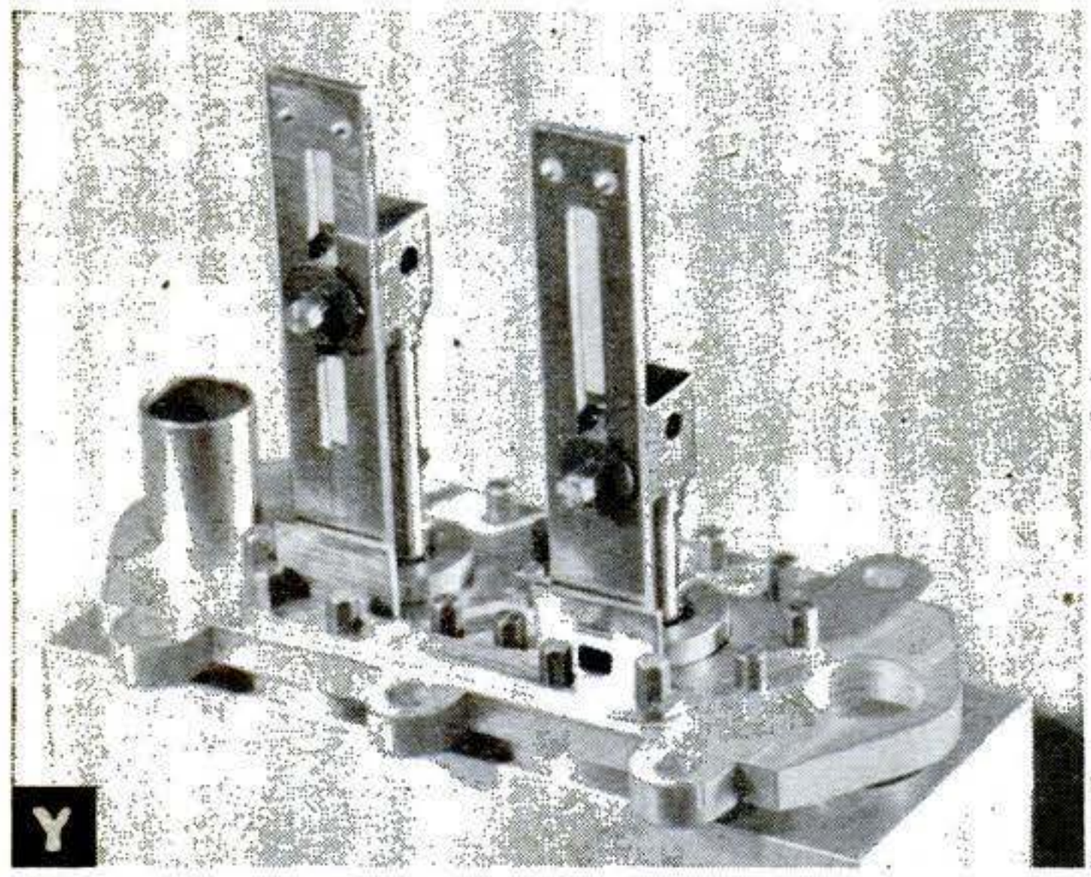
W

Pistons are turned from brass or dural rod to an easy fit in the cylinders. Parting tool is used to cut groove for piston ring. Center of piston is drilled and tapped for 6-32 thread on upper end of piston rod. Piston is then faced, cut off and reversed in the chuck for facing opposite end and bringing to dimension.



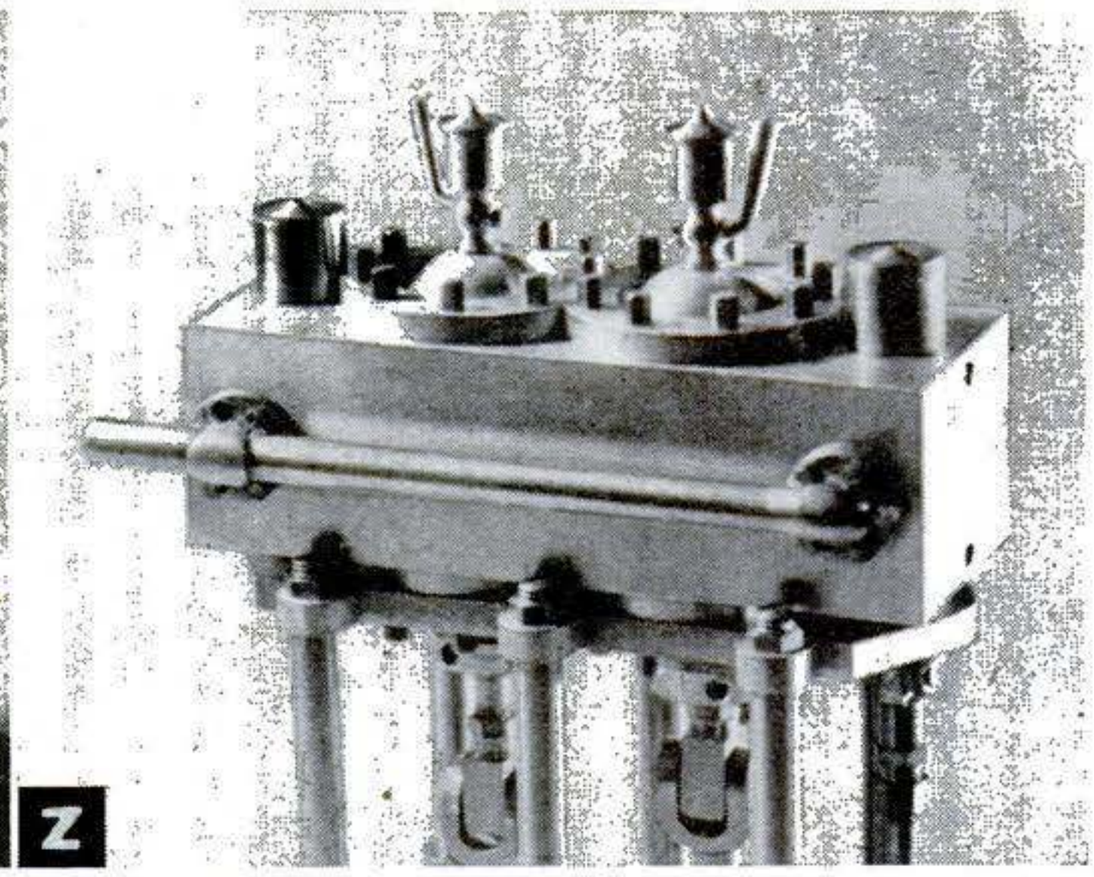
X

Cast-iron piston rings, of standard 1" size, are purchased commercially and fitted to pistons. Lower end of piston rod is threaded 6-32 to fit in crosshead. Lock nut is tightened against top side of piston after upper end of rod is threaded into center hole to prevent piston from working loose on piston-rod threads.



Y

Upper assembly is tested for smooth action. Bracket for upper ends of crosshead guides is cut from brass angle. Setscrews holding washers on crossheads have shoulders turned to length that will bring washers up against slotted guide without forcing them tight. Setscrews join cylinder support to cylinder.



Z

Petcocks on cylinder covers are dummies but could be drilled and used as gravity-feed oil cups. A displacement oiler should be fitted for model-boat use. Caps for valve liners are drilled No. 50 to vent space above valves; they are turned to a snap fit. Intake manifold is ¼" tubing soldered into turned fittings. END

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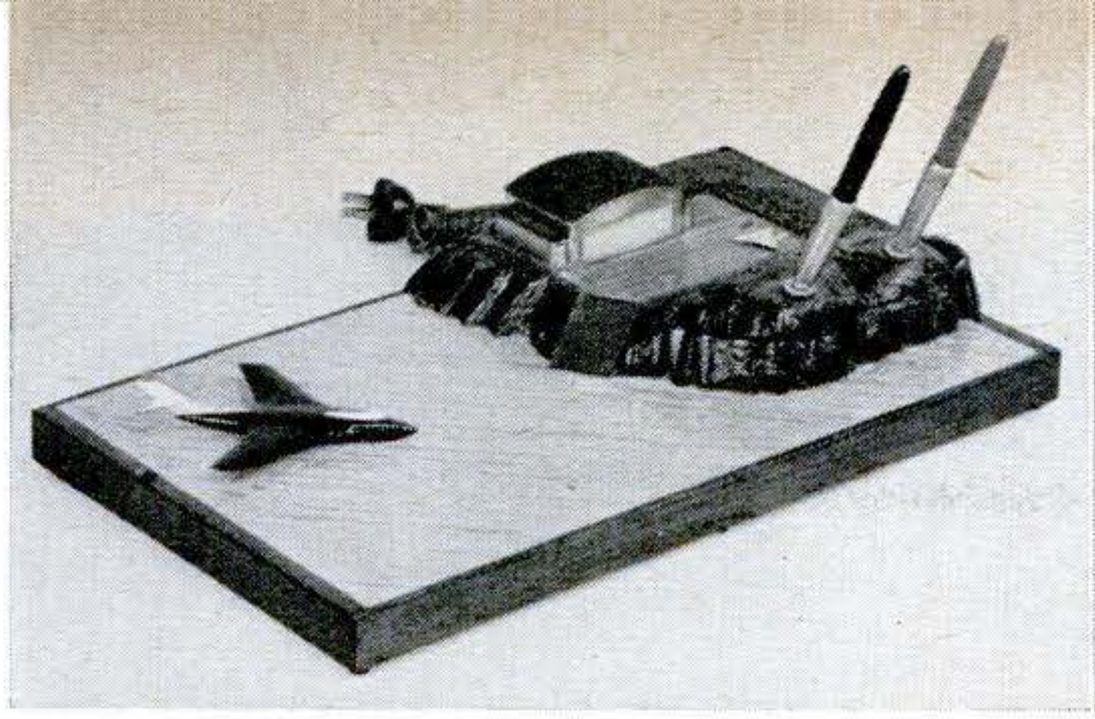
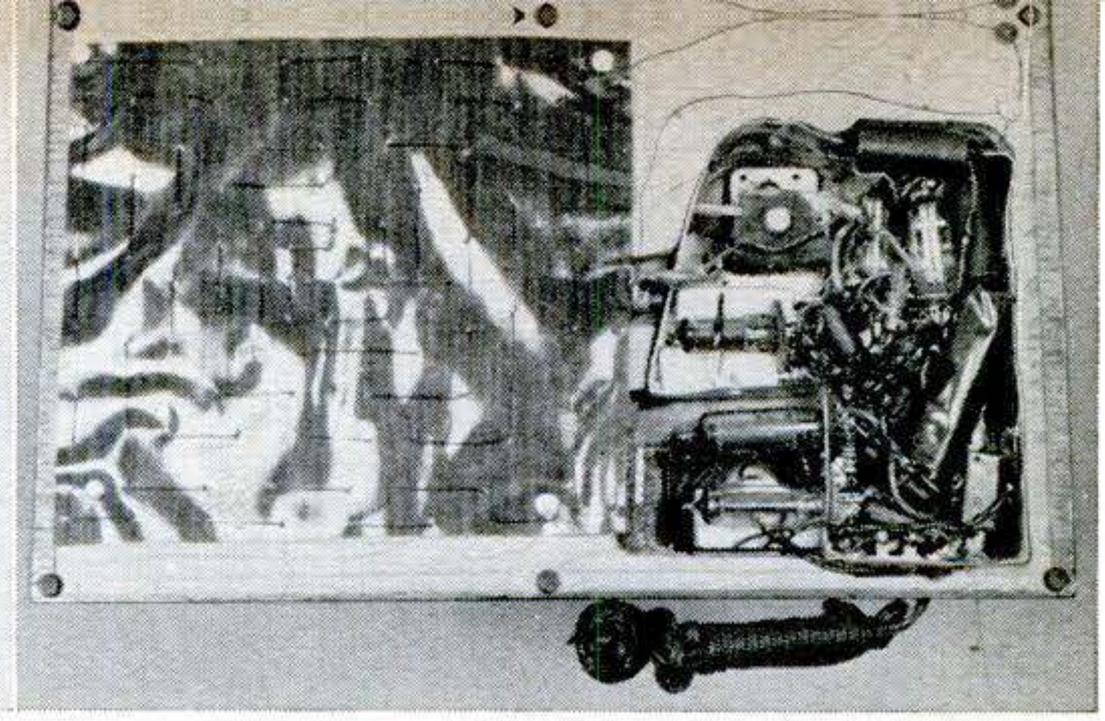




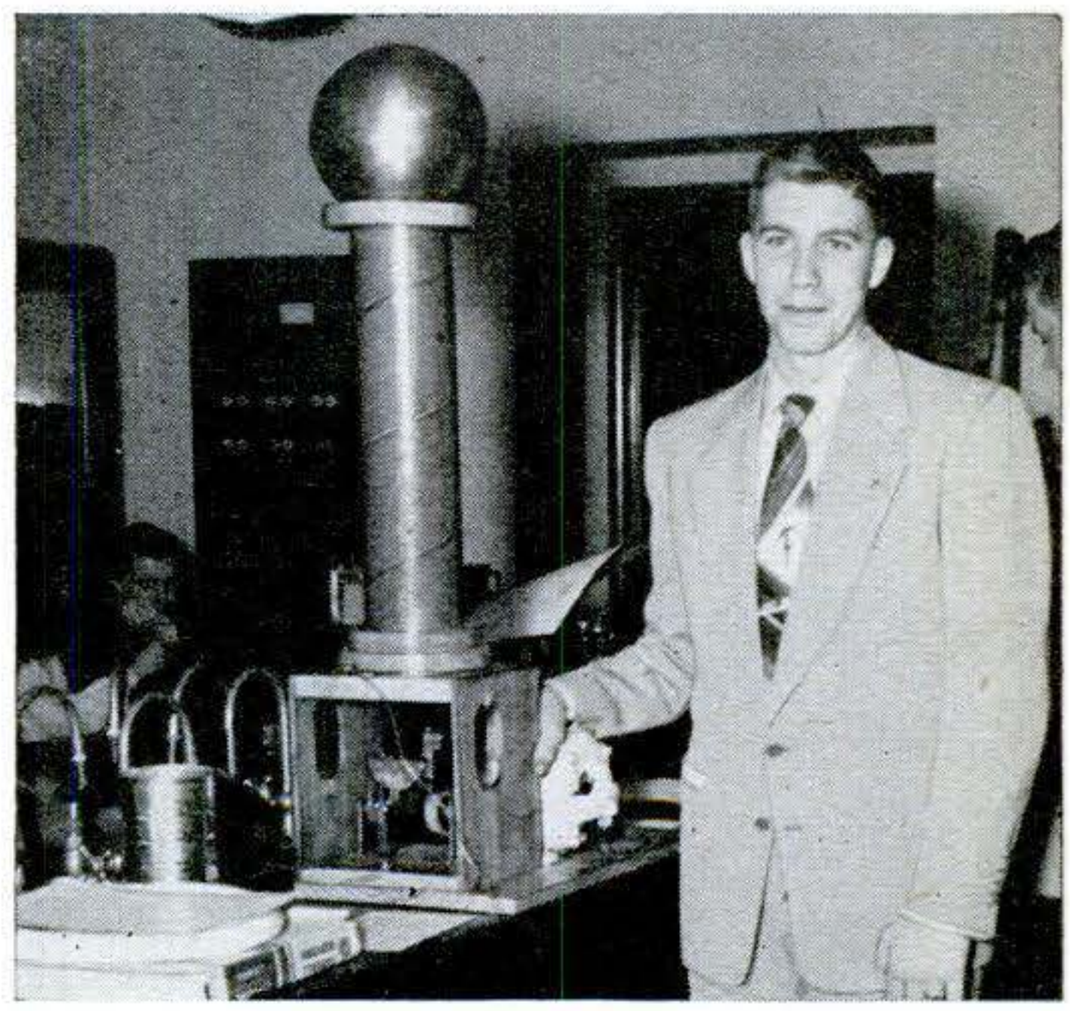
Desk Set Gets Music. Turn the penholders of this desk set and a five-tube radio plays through a 2″ oval speaker under the seaplane hangar. The opal-glass front of the hangar is the tuning dial.

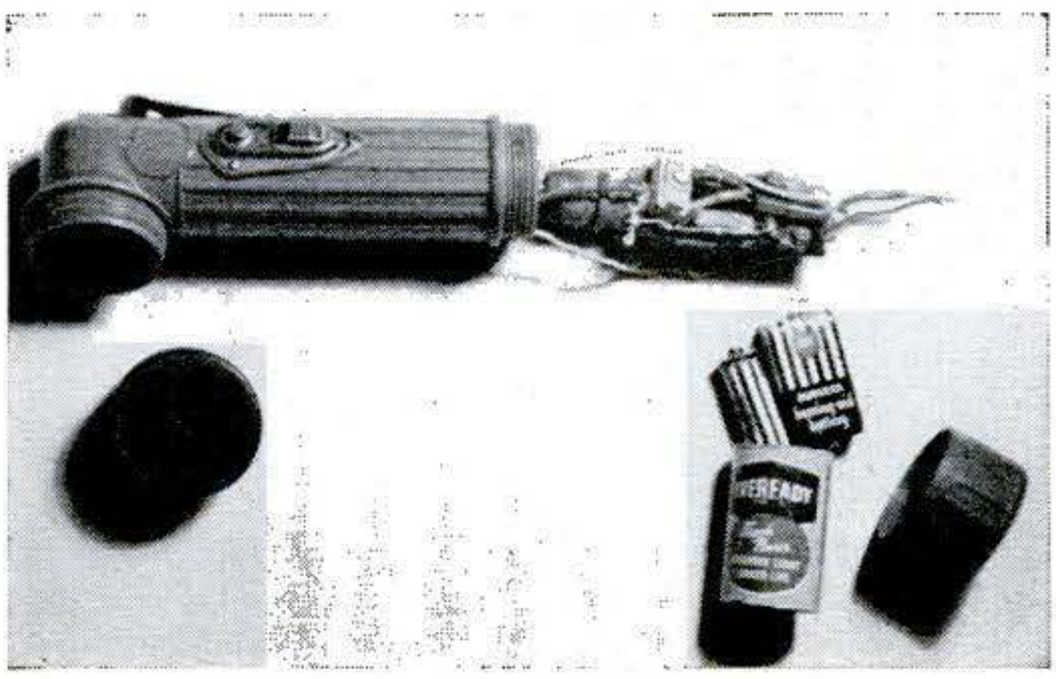
Mahogany was used for the base, land area and large flying boat, the sea being represented by oak plywood with the grain running diagonally. The hangar walls, penholders, small aircraft and parts of the big one are gold-plated brass. Built by Wing Comdr. J. R. Frizzle of the Royal Canadian Air Force, the 2½″ by 9½″ by 16″ set has a loop antenna inside it.

Craftsmen Put Electricity to Work

Light Beam Steers Boat. A photocell slowly turning atop this 30″ model cabin cruiser puts human fingers at its helm. Cruising at five miles an hour, it can be started, stopped and steered by triggering the photocell with spotlight flashes. Gilbert M. Turk of Paramus, N. J., used five miniature motors and a ratchet relay in the circuit. A single vacuum tube amplifies the photocell signal to work a 2-milliampere relay that operates stepping relay.

Flashlight Radio. Ingeniously housed in an L-head flashlight case, this little receiver has an earphone where the lens and reflector used to be. A 2E32 tube, 1½- and 22½-volt batteries and a simple circuit tuned to the strongest local station all fit into the barrel. Made by Richard D. Sklenar of Havana, the set plays with its antenna clip connected to a water pipe, bicycle, or other metallic object. The flashlight switch turns it on or off.





Sparks 6″ Long snap about when this model Van de Graaff generator is driven by an ordinary electric motor. Robert Fox, a high-school senior, built it from plans in PSM (Oct. '46, p. 188). Entered in a science exhibition, it won him a recommendation for a college scholarship. The motor drives a silk belt running over pulleys in the base and in the sphere at the top.

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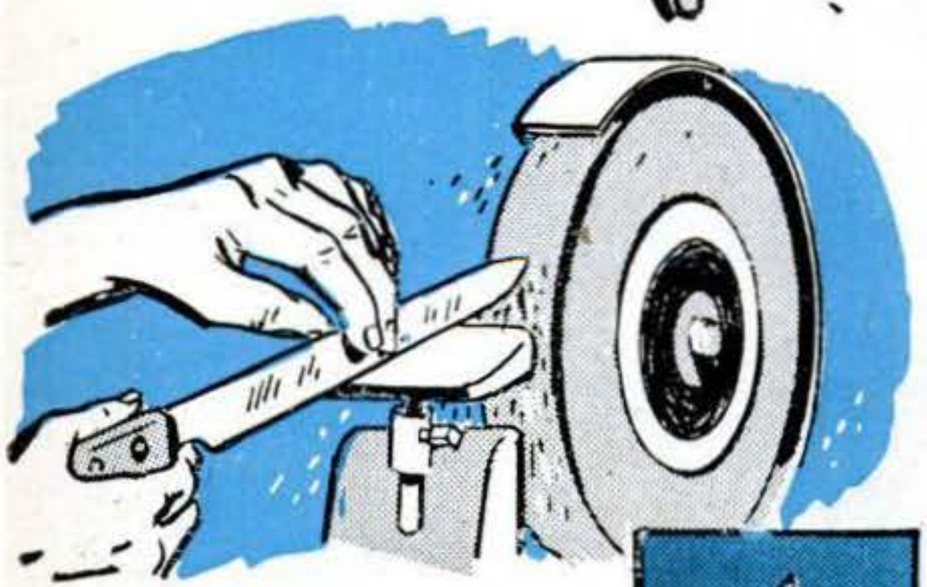
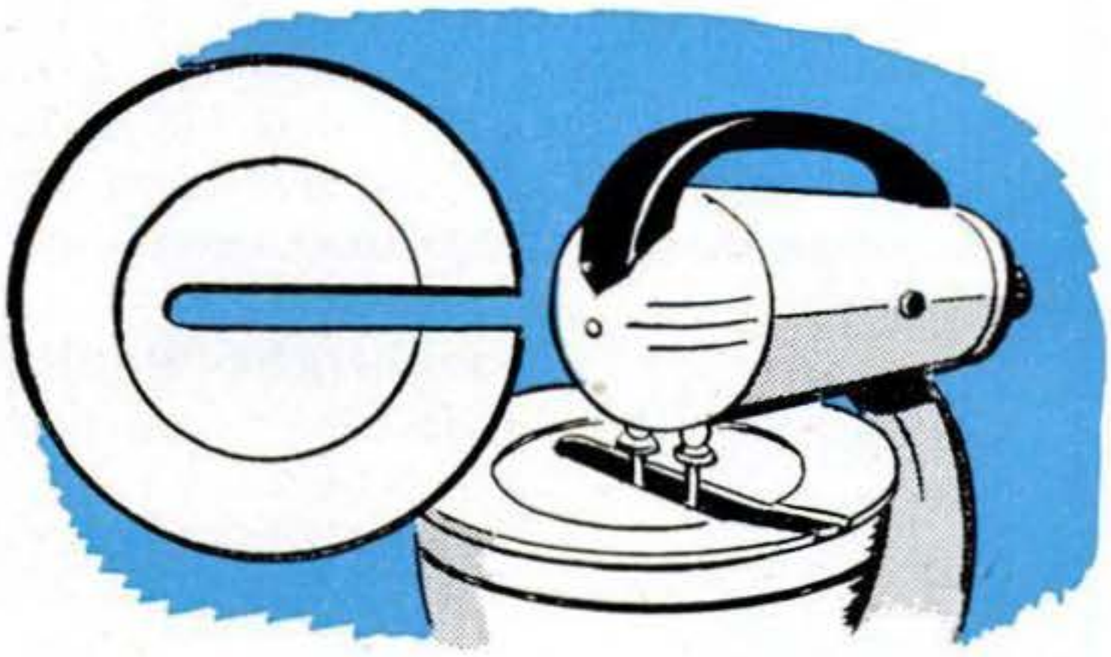
KEEPING THE *Home* SHIPSHAPE

A toy bin that rides out of sight beneath a bed will store many toys now underfoot. You can make one easily by attaching flush-plate casters to an old suitcase.

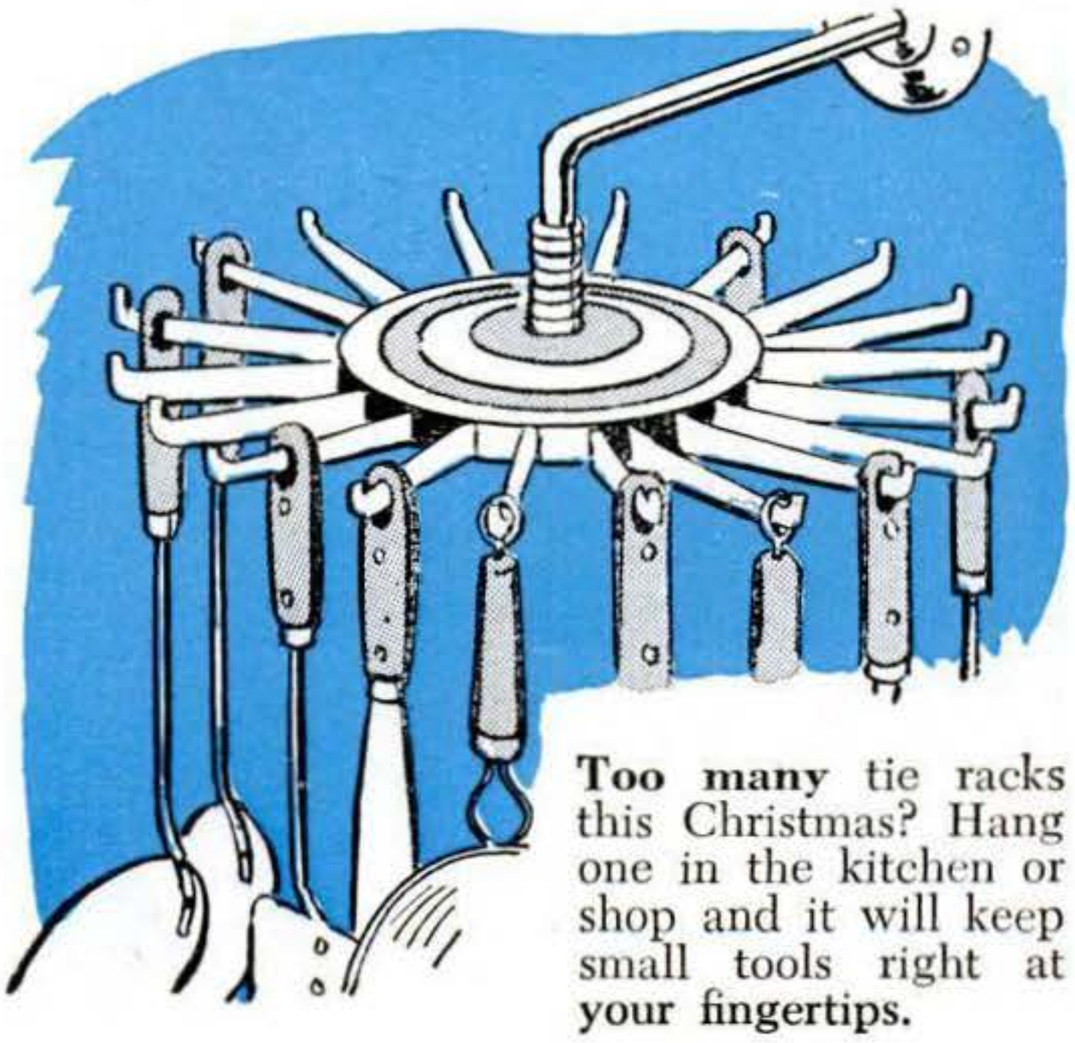


Sharp points on sharp knives mean double danger. If points are rarely used, grind down until they are rounded.



To put the lid on spatters, cover the mixing bowl with a slotted plastic plate. Cut the slot with a jigsaw or coping saw, and smooth edges.

A fishing creel hung low on a closet door is a handy catchall for children's woolen mittens, caps and scarves.



Too many tie racks this Christmas? Hang one in the kitchen or shop and it will keep small tools right at your fingertips.

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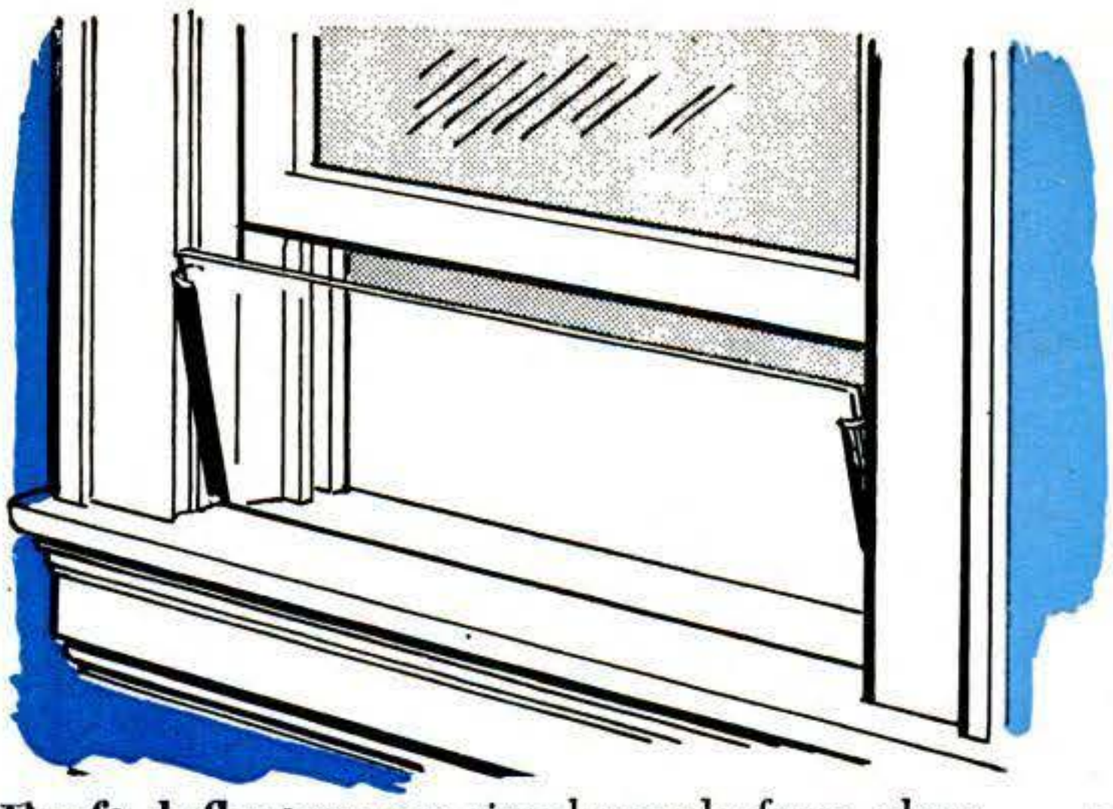
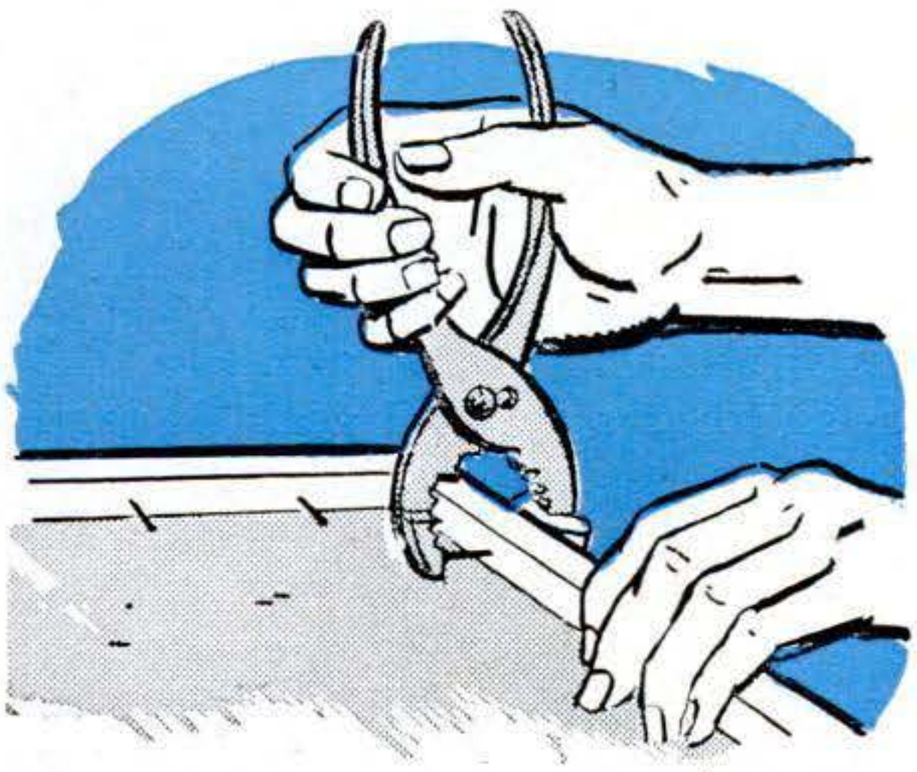
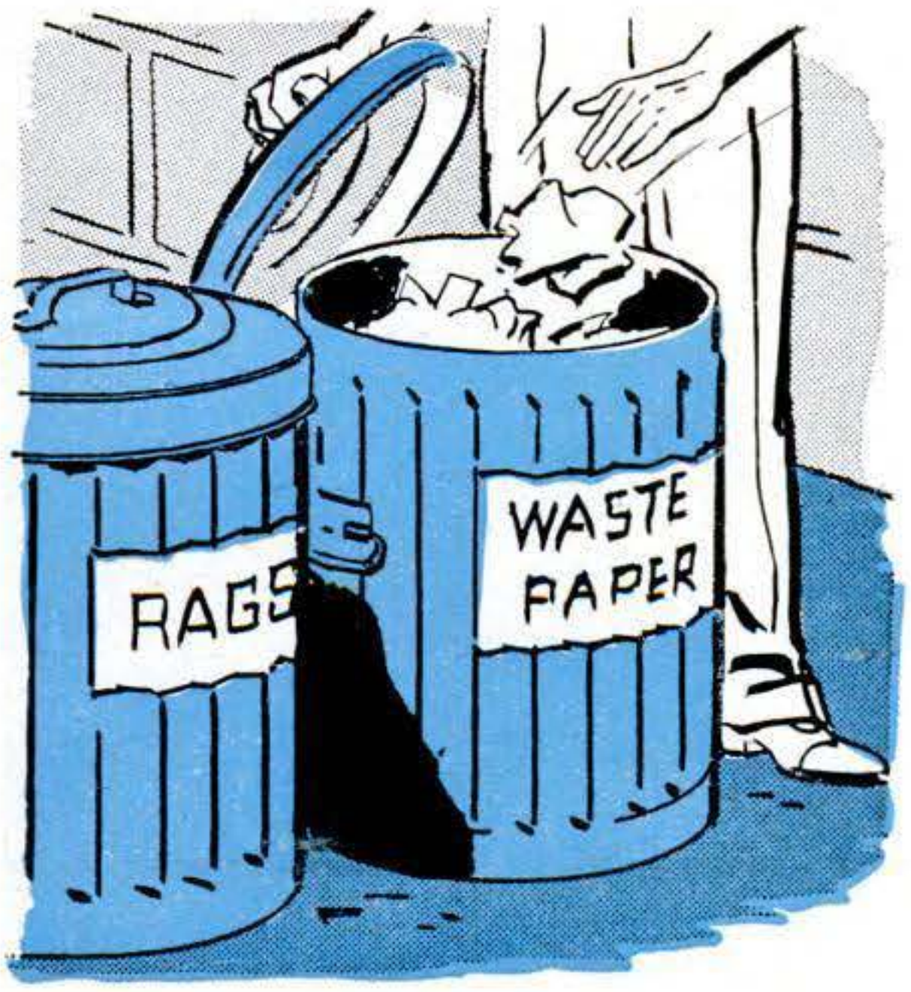


Draft deflectors are simply made from glass or plywood. Slit rubber hose fastened at each end will keep the deflector firmly wedged between the window jambs.

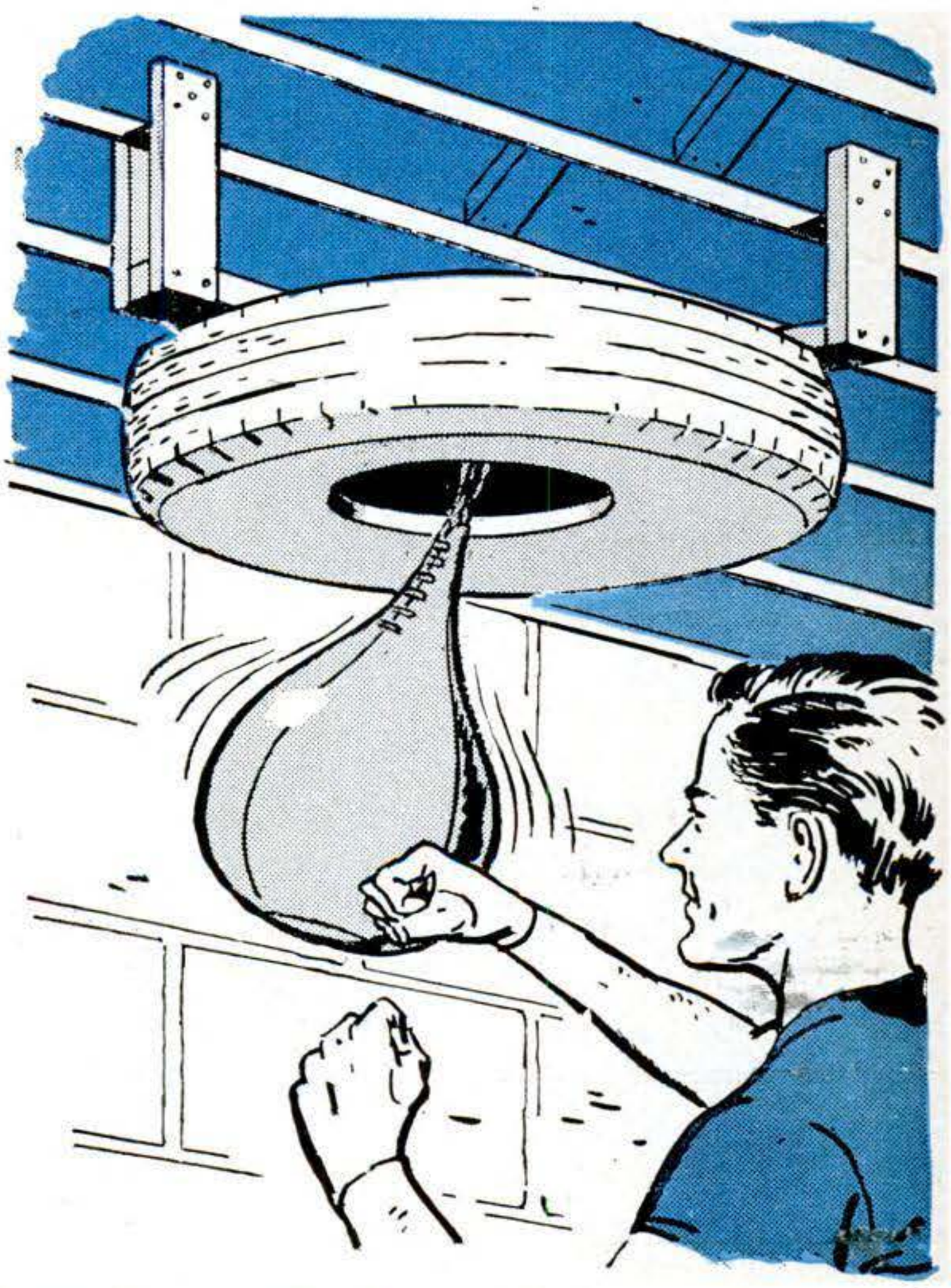


When framing pictures, try driving in the brads with slip-jaw pliers. Open the jaws wide and, holding the nail in position with the other hand, apply firm, steady pressure.



A jumbo canister set for the cellar can be made from unused ash cans, cleaned up and painted. They'll safely hold rags and paper waste. A can with the bottom cut out and replaced with screening for ventilation will serve as hamper for basement laundry.

When the heat's on, floors shrink; so now is the time to fix gaps between boards. Clean out cracks and fill with a paste mixture of sawdust, shellac, whiting and color.



A punching-bag platform made from an old tire and tube is less noisy. Fix the tire to a wooden cross and mount it on the ceiling with enough bracing to prevent excessive vibration.

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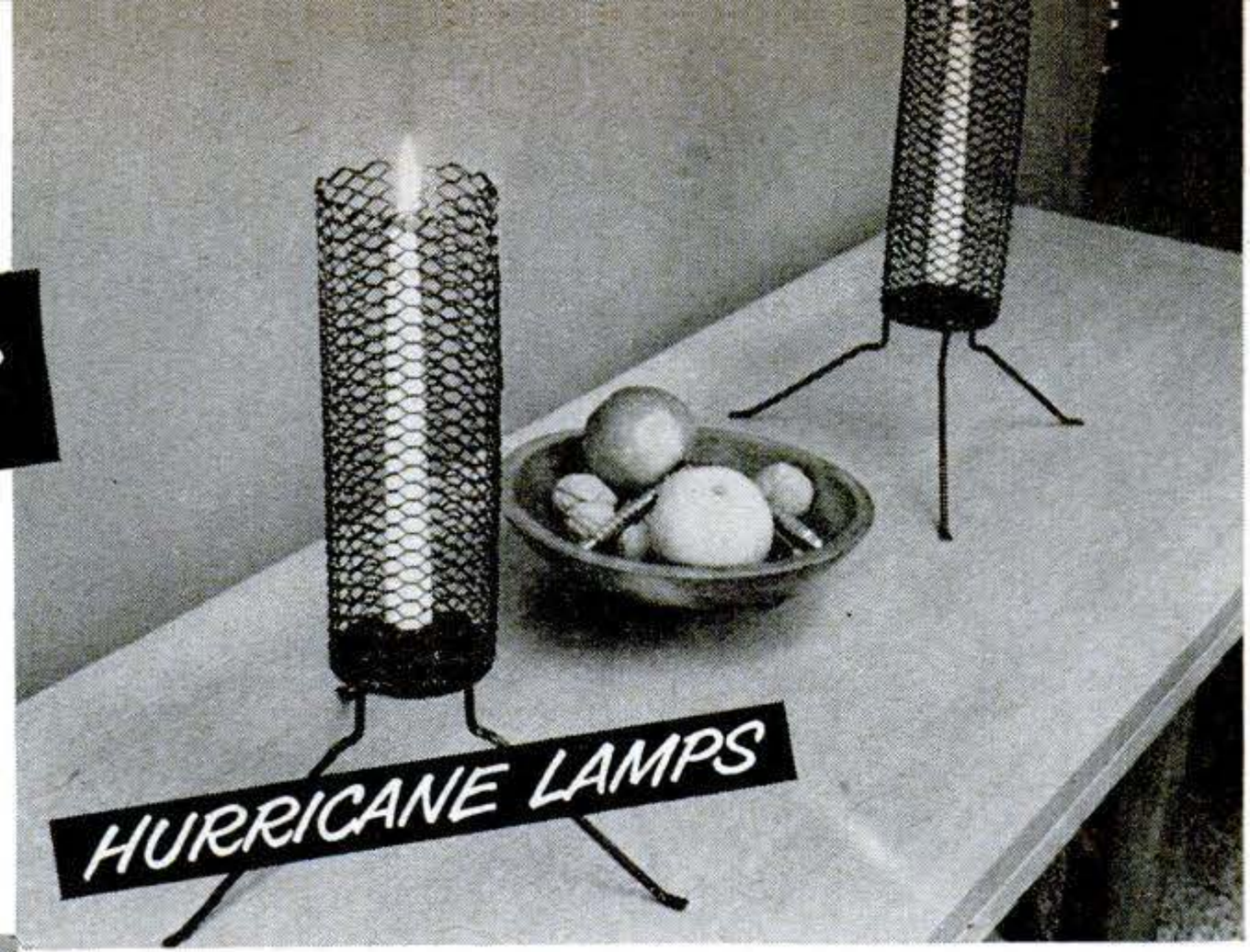
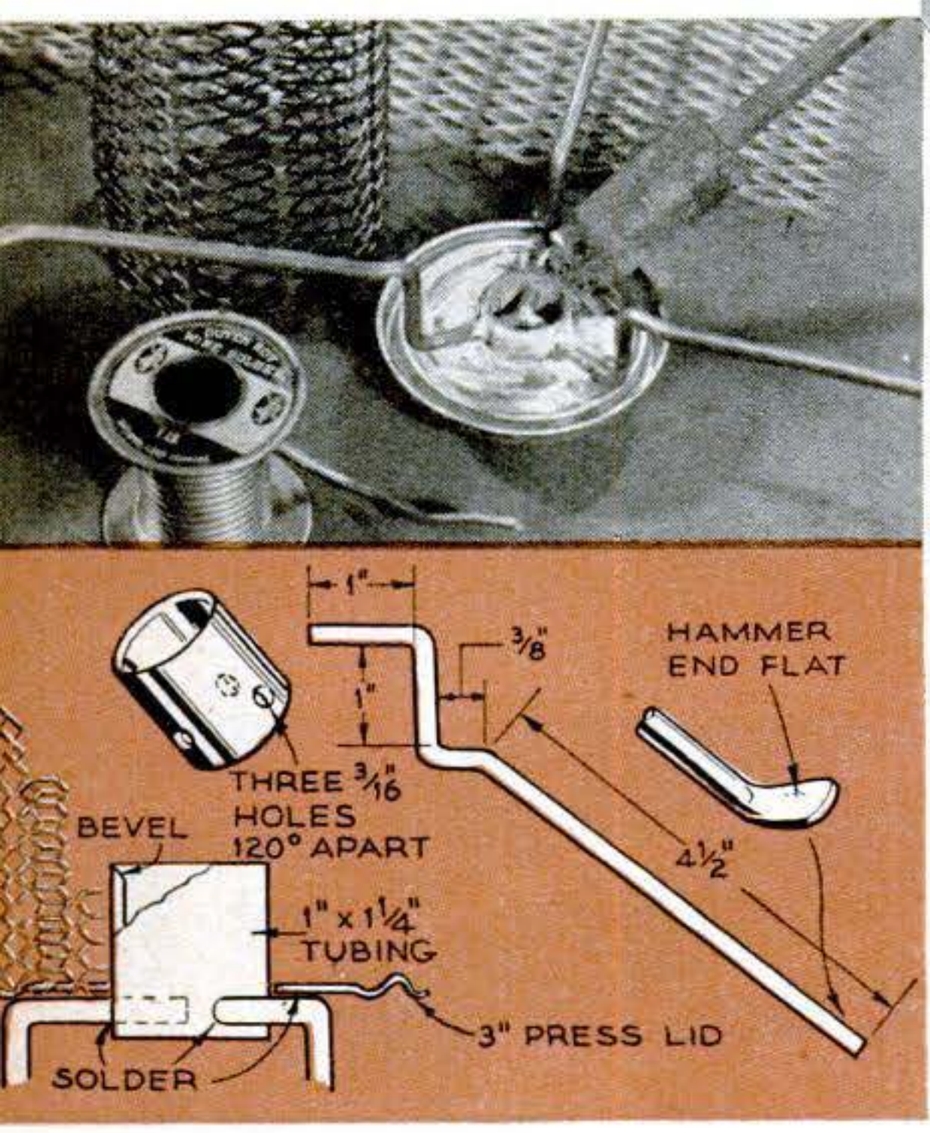
One Evening Shop Projects



HURRICANE LAMPS

USE WAVY EDGE of metal lath for top of chimney. Close seam by soldering, wiring or hooking parts of one edge around the other. Solder legs together at the center and to the socket and can lid as shown below.



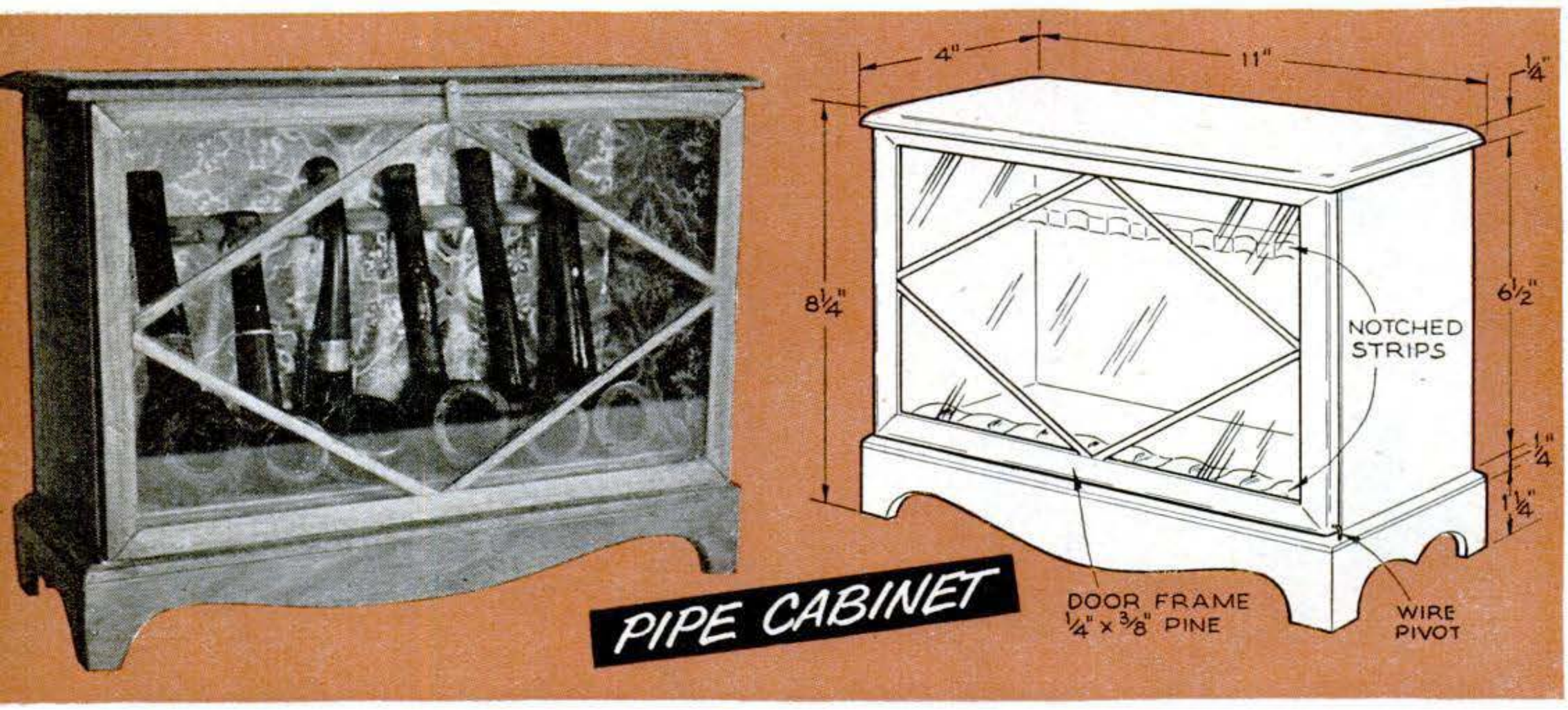
Screen chimneys put these hurricane lamps in tune with the trend toward wrought iron.

Bend three identical legs from 3/16″ rod, hammering the ends flat to serve as feet. Cut a 1¼″ length of 1″ tubing or conduit square and drill three holes near one end. File an inside bevel at the other.

Cut a 1″ hole in the center of a paint-can lid, insert the legs in the holes in the tubing, slip on the can lid upside down, and solder the legs to both lid and tubing.

Cut a 9″ by 9½″ piece of expanded-metal lath with the longer dimension along the wavy finish edge of the sheet. Roll the piece around a rolling pin or pipe, making the cylinder a close push fit on the flange of the can lid.

All parts should be finished by spraying with dull enamel or lacquer. As there are no large surfaces, even a fly sprayer can be used if the paint is well thinned.



PIPE CABINET

Antique pipe racks that look like this one cost lots of money. But this copy was made of ¼″ pine from an apple crate. The parts were assembled with small wire nails and glue and the interior covered with wallpaper. The glass in the door is windowpane with wood strips glued to it. The cabinet was stained a light honey brown and brushed with a coat of clear lacquer.—*John Rogers, Dallas.*

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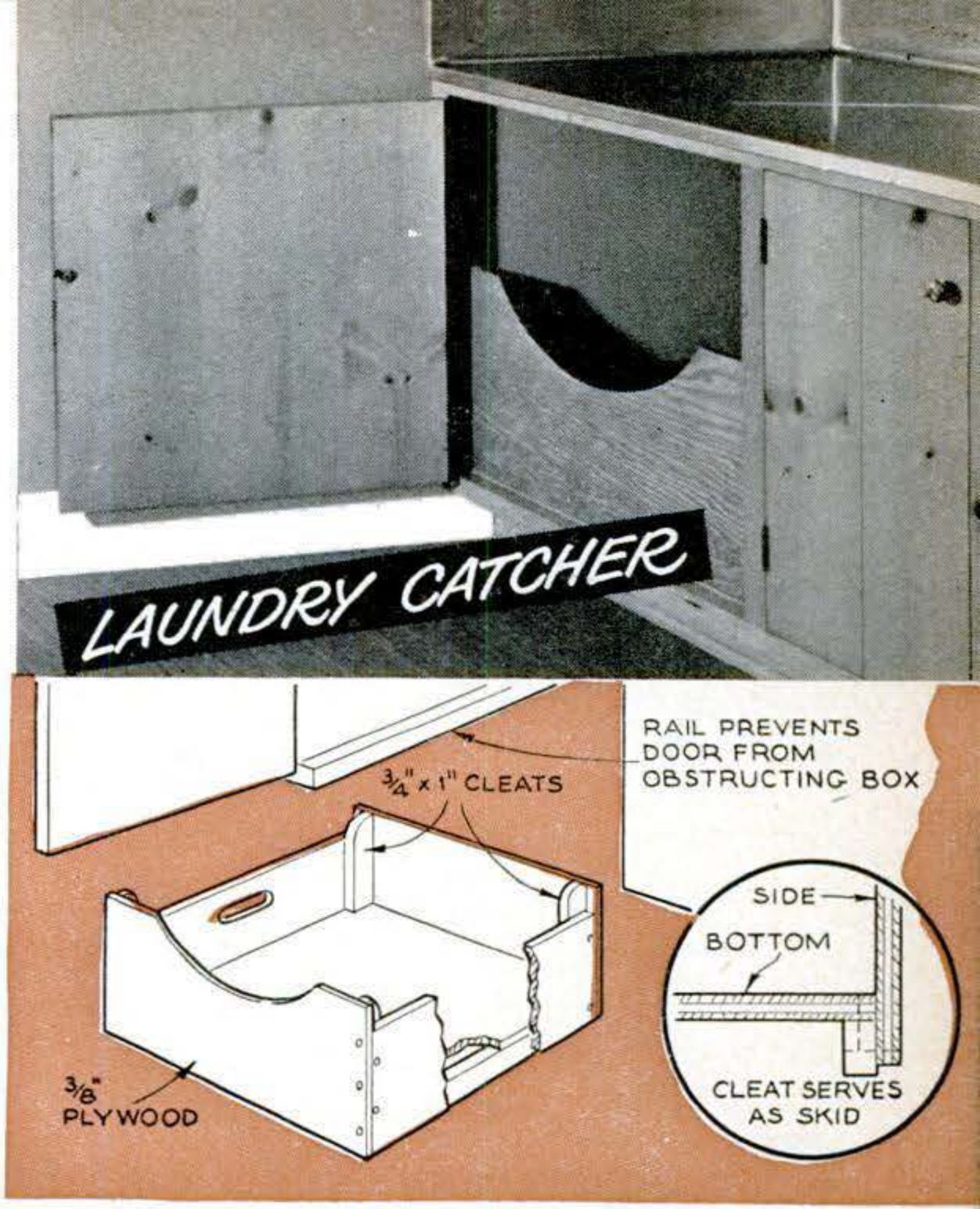
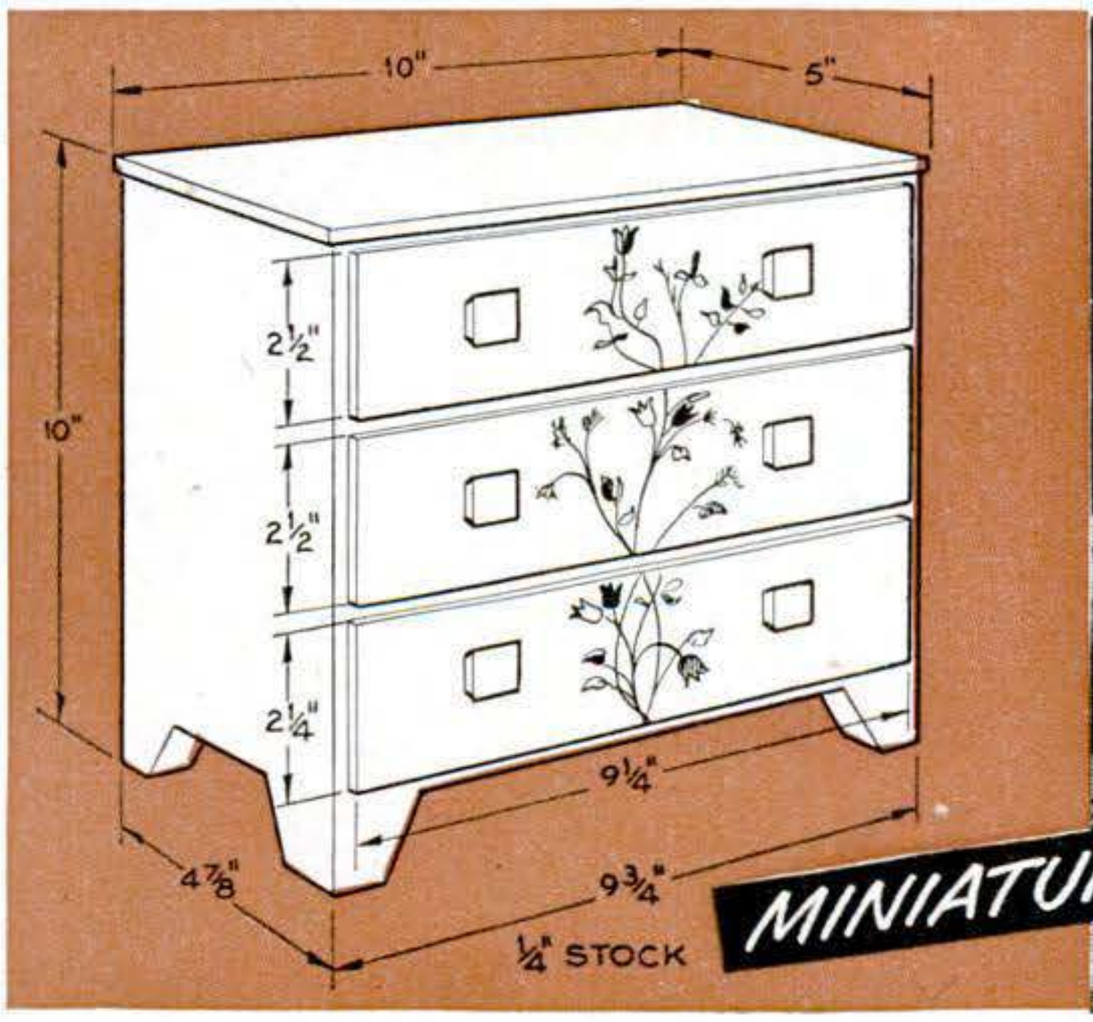
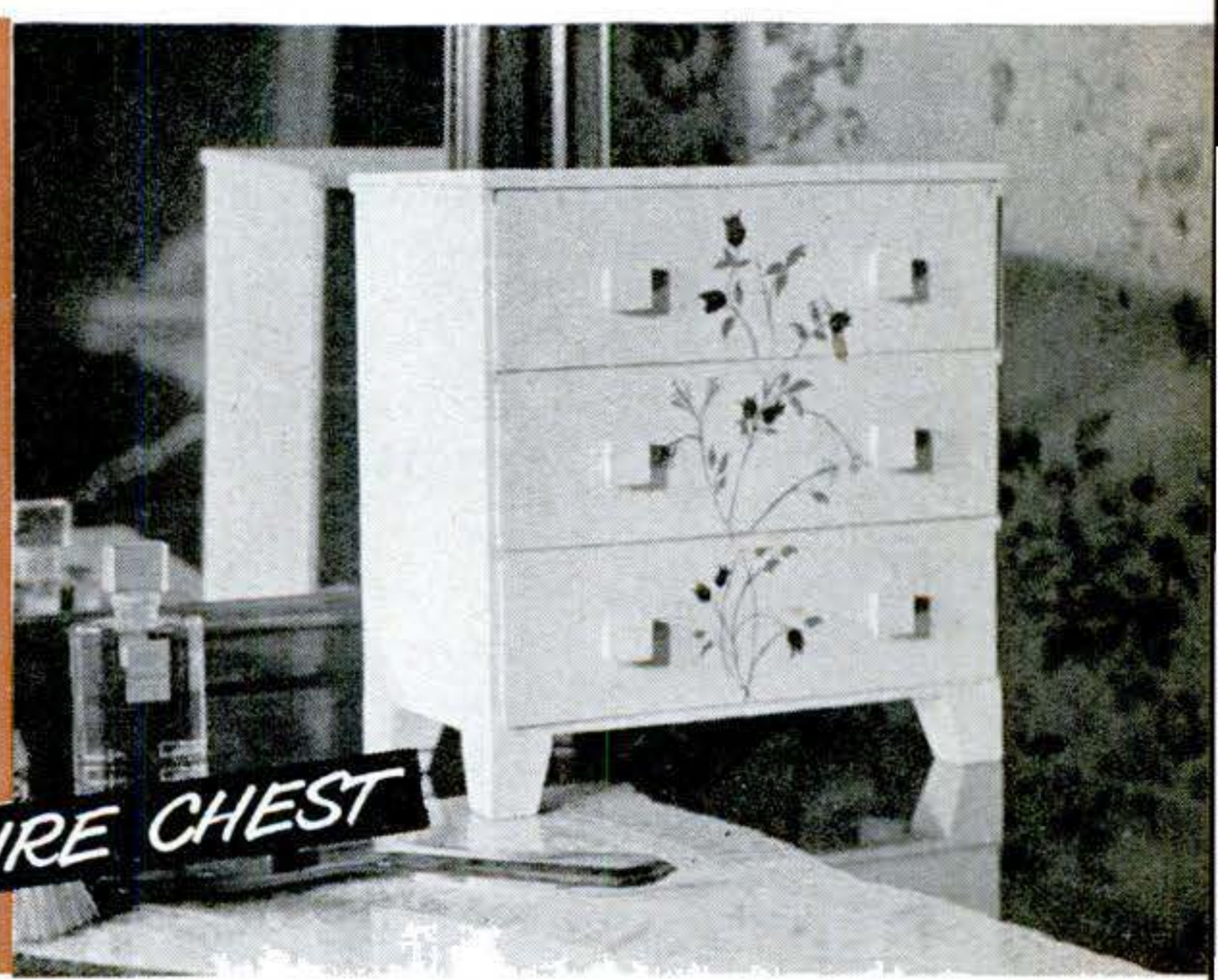


A nautical note was added to our living room when I built this fireplace set around a surplus Navy Danforth anchor. A length of channel was bent and welded to form the base and a metal pan was welded to the channel to make a bottom. Near the top of the shank, two arms of ¾″ steel were welded to support the shovel, broom and poker.—*A. J. Kates, Pacific Palisades, Calif.*

Soiled linen can be neatly collected in this kitchen or bathroom compartment. The photo at top shows the easiest way—a half-height plywood front nailed within a hinged-door compartment. The drawing shows a more convenient laundry catcher—a big drawer that can be pulled out for removing and sorting the clothes for washing.—*Hi Sibley, Nuevo, Calif.*





Jewelry, playing cards or cigarettes can be stowed in this 10″ high, three-drawer chest. All the parts are birch, except the sides and bottoms of the drawers, which are plywood. The chest is glued and bradded together. After it was painted, the floral design was traced on with carbon paper and then painted in with a fine brush. You could also use decals for decorations.—*Bertram Brownold, Cedarhurst, N. Y.*

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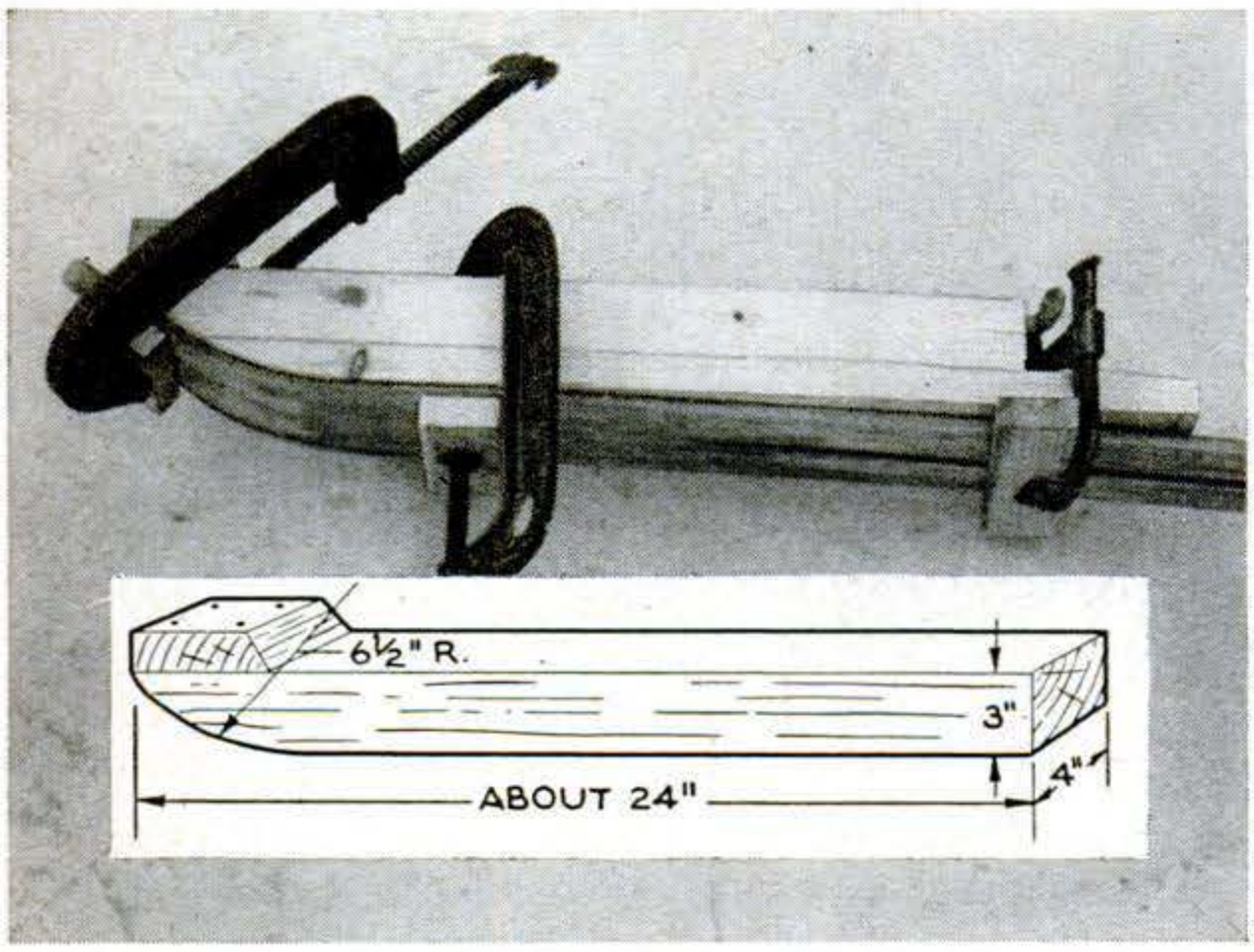
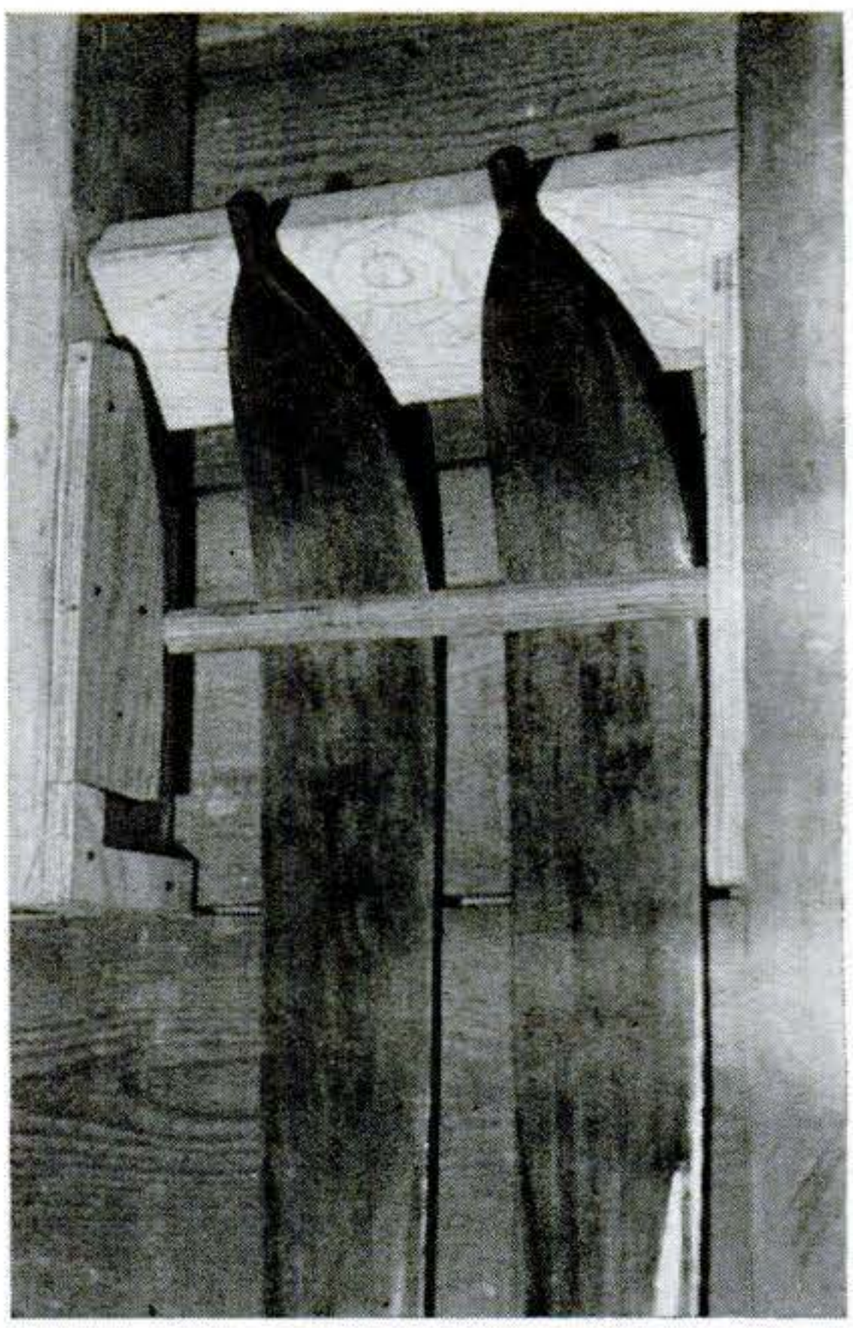
How to Restore Curve to Ski

TIPS of wooden skis often tend to lose their curves after long service, making them dangerous to use. To reshape the tips, steam or boil the front 24″ of each ski for 30 minutes or more. Then clamp it to a bending form until thoroughly dry. Store skis in a rack that will maintain the curve (right below). Before steaming, sand off all varnish so the steam can penetrate.—*R. S. Wilkes, Keuka Park, N. Y.*

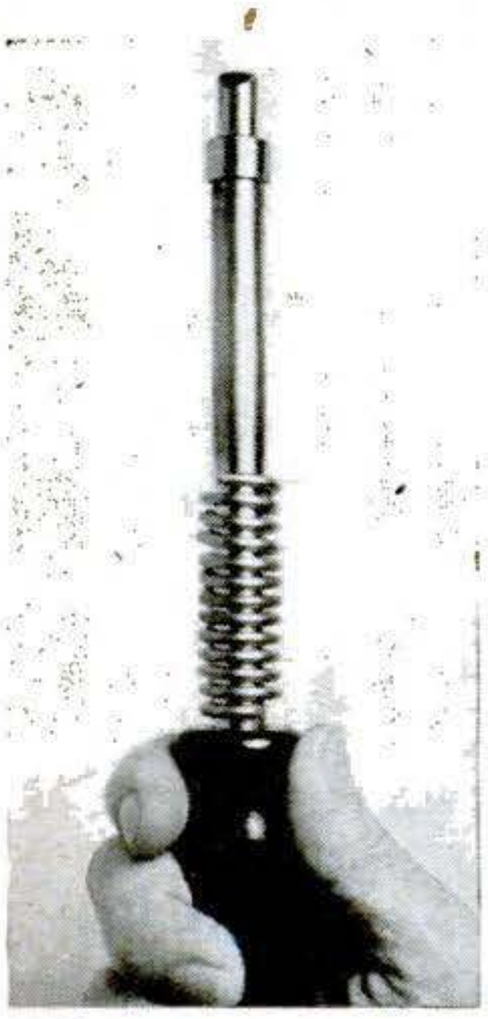
STEAM ski tips until they can be safely bent. It may take up to an hour. Roasting pan on the stove (above) will do the job.



CLAMP steamed ski to a built-up bending form. Clamp the tip first and work back with other clamps. Use wood pads under clamps.



STORE skis as at right to retain curves. Garage wall is a good spot for rack. Adjustable dowel is raised to lock skis in place.

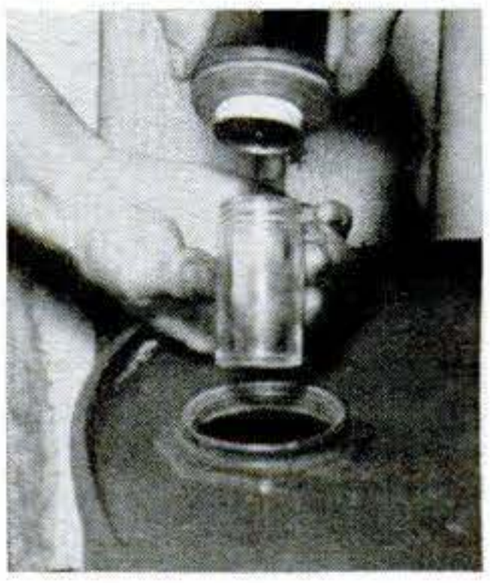


Coil Cools Iron Handle

DURING prolonged use, the handle of a soldering iron often becomes uncomfortably hot. A short length of 6- or 8-gauge copper wire wrapped around the body of the iron will radiate much of the unwanted heat before it reaches the handle.—*A. Trauffer, Council Bluffs, Iowa.*

Money for Oil Left in Tank

WHEN no one is home at our house and a fuel-oil delivery is due, we leave the money in the oil tank. It goes into a simple little gimmick I made by riveting the cap of a jar inside the oil-tank cap. After the money is stuffed in the jar, the jar is screwed to its cap and the tank cover replaced. The jar would also be a handy place to park an extra key to the house.—*Edward C. Robare, North Adams, Mass.*



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Brother, you can't go wrong on these tools."

"Ask any mechanic who *is* a mechanic about Bonney tools. You'll get the straight dope on why they're tops.

Believe me, you get the *best* tools at standard prices. I *know* — I sure check price.

My tool kit is full of Bonney knucklesavers. They have a 'feel' that makes you sure of first class work. That means more dough in the pay envelope.

Another thing! If you're short on cash, take a look at a BON-E-CON* tool. They carry the standard Bonney guarantee."

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BONNEY TOOLS

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Street signs photographed in color through a diffraction grating create startling effects.

Spectra are brightest against dark background. Both photos were shot at 1/8 second at f/8.

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How to Expose Flying Saucers

You're invited to join the Air Force's new project for studying saucers by photographing them through a diffraction grating—a device that reveals the chemical composition of a source of light.

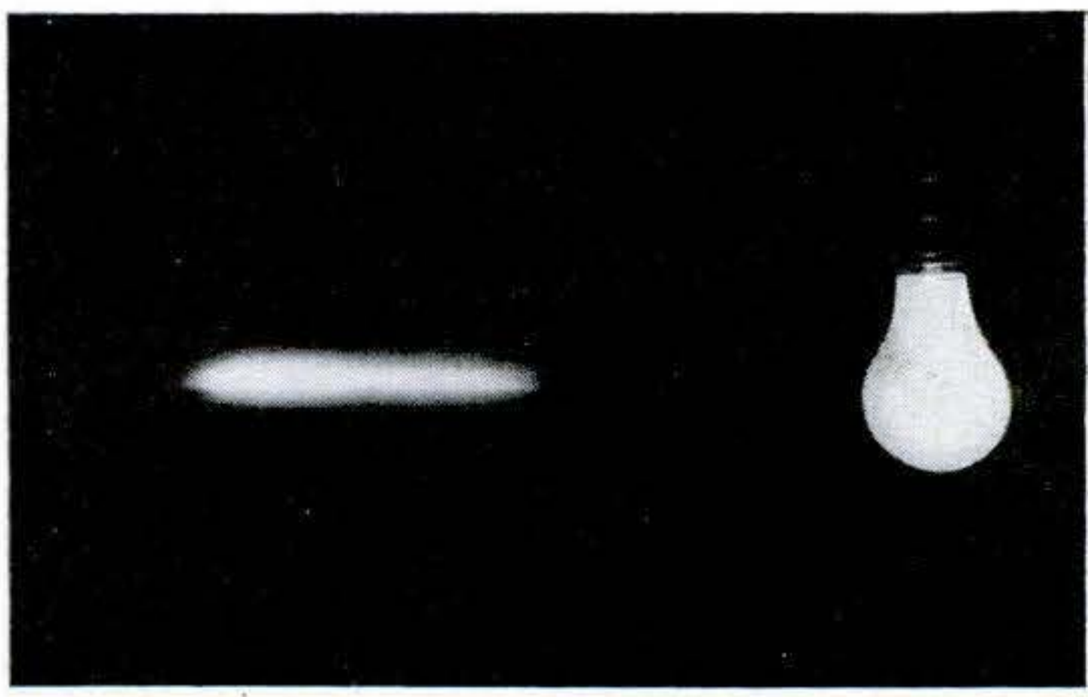
By Ralph Steiner

THE U.S. Air Force has set a new squad of 200 detectives on the trail of the flying-saucer mystery. These sleuths are photographers armed with cameras specially equipped to take pictures that may reveal the source of strange lights in the sky. Because similar equipment is available to anybody, you, too, can join the hunt.

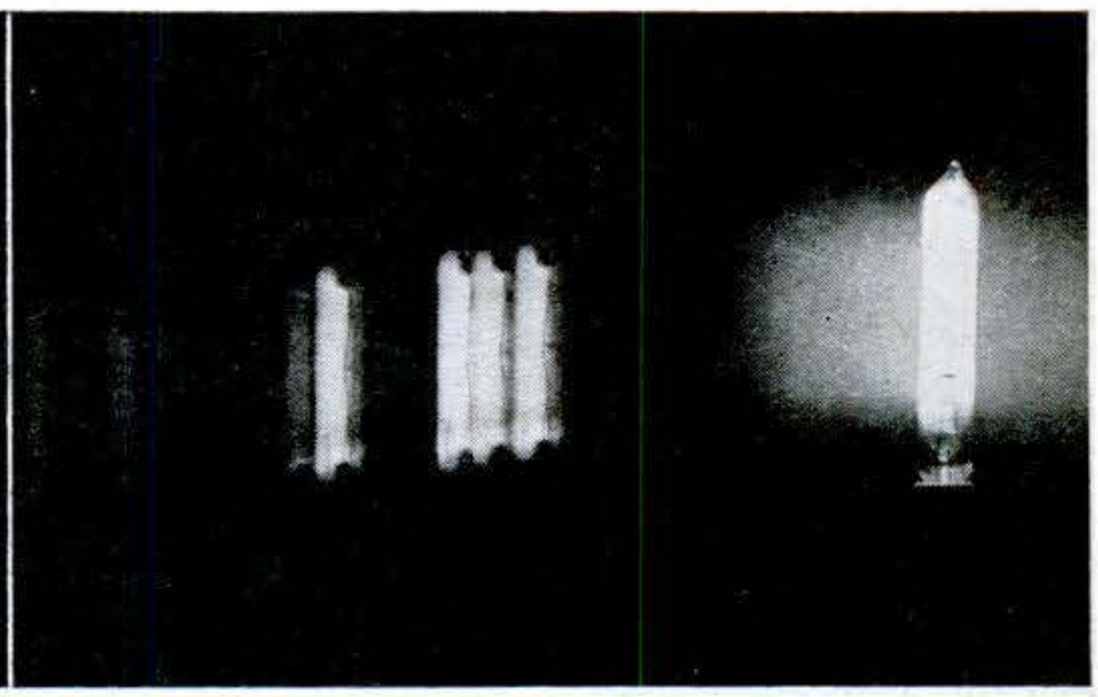
And even if you never get a chance to shoot a flying saucer, you can still have a lot of fun with a homemade version of the saucer camera with which the Air Force hopes to separate hoax and hallucination from scientific reality.

The camera the Air Force will use is the Videon Stereo with twin matched lenses of 35-mm. focal length and a maximum aperture of f/3.5. It takes standard 35-mm. film cartridges. A stereo camera was chosen, not because it takes stereoscopic pictures, but because it offers a convenient means of taking two pictures at the same time.

One lens will shoot a conventional picture. The other—and here we come to the gimmick the Air Force is pinning its hopes on—will be covered by a diffraction grating. This is a glass or plastic plate ruled with extremely fine lines—as many as 15,000 to the inch—scratched on the surface with a diamond point. The original grating is created on a special "ruling machine"—an instrument so sensitive that the heat of an approaching human body can upset its accuracy. Reasonably priced replicas are



A SOLID LIGHT SOURCE like this mazda bulb projects a continuous spectrum through a grating. Red end of spectrum is most intense.



A GASEOUS LIGHT SOURCE—a mercury-vapor sun lamp—produces a discontinuous or broken spectrum, mostly violet, blue and green.

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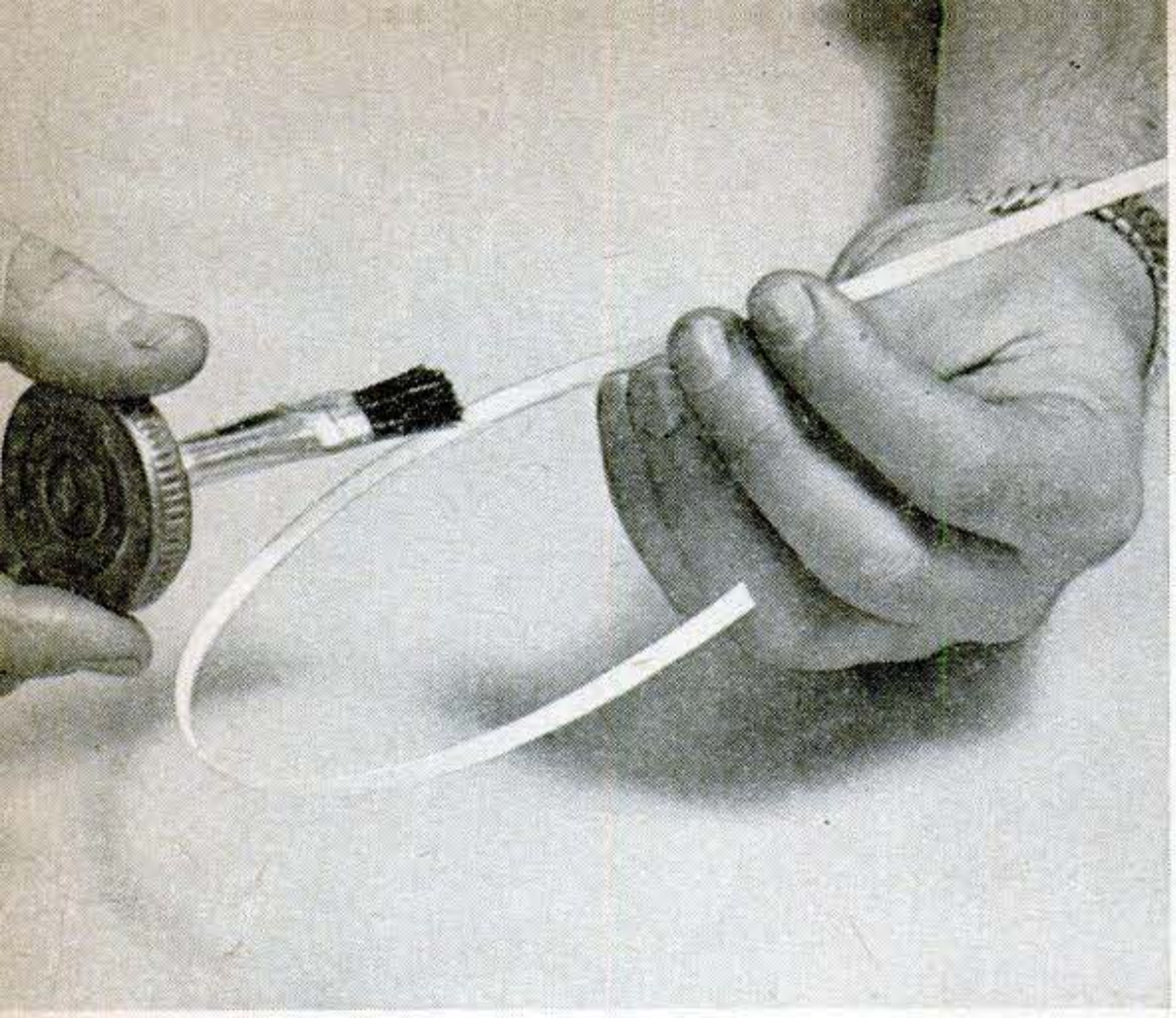
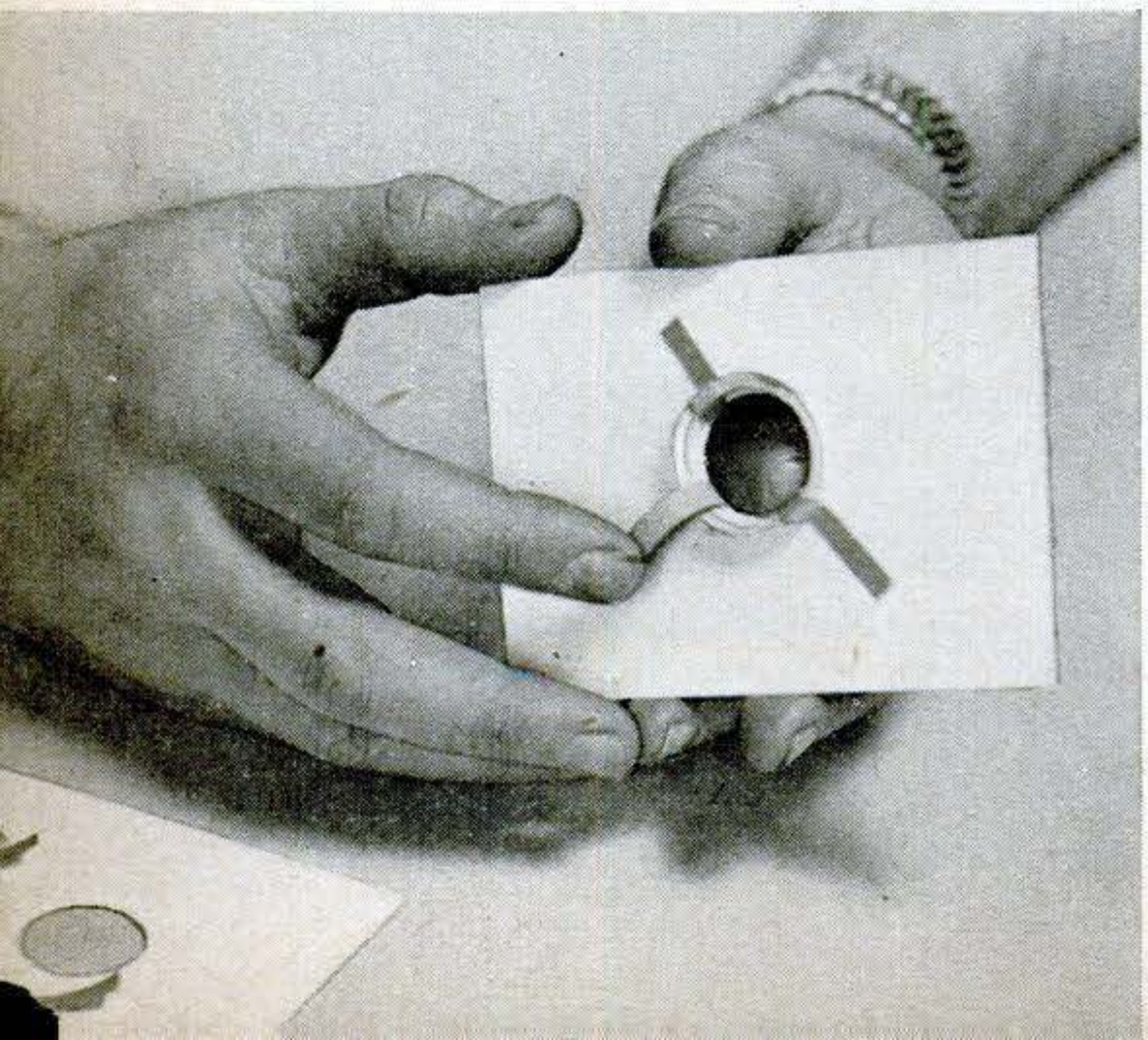


1 TO MAKE YOUR OWN grating holder, cut a cardboard strip a bit wider than lens projection. Coat both sides with rubber cement.

2 WIND STRIP around the front of the lens, loosely at first, then tighter, to form ring ⅛-inch thick. Fasten end with Scotch tape.

3 CUT HOLES the size of your lens out of cardboard square slightly larger than grating. Tape ring to card with gummed paper strips.



made by using this costly original as a mold.

Like a prism, a diffraction grating breaks up light into its component colors. The fine slits in the grating bend the light rays as they pass through—separating them into bands that range from the violet end of the spectrum through the blue, green, yellow and orange sections to the red end of the spectrum. The way in which these bands are projected onto the film reveals the nature of the light source.

Light Source May Be Solid or Gaseous

For example, the light from a mazda bulb produces an unbroken or continuous spectrum, indicating a *solid* light source—the heated tungsten wire. On the other hand, a fluorescent tube projects a number of separated bands of light—a discontinuous spectrum—indicating a *gaseous* light source.

It is not necessary to use color film. The Air Force itself is using black and white. It is the arrangement and intensity of the light bands on the film that provide the information the scientists want.

Suppose you send the Air Force two saucer pictures photographed through a diffraction grating. The first shows a continuous spectrum of greatest intensity at the red end, the second a discontinuous spectrum most intense in the area which would be green on color film.

The trained analyst will interpret the light source in the first photo as a solid (continuous spectrum) of relatively low temperature (greatest intensity in red area) and conclude that your first saucer is probably a reflection of a mazda light source on the ground—a car headlight perhaps. Your second photo, indicating gaseous matter at high heat as the light source, will most likely be set down as a meteor—the well known "green fireball" saucer.

Of course if the Air Force discovers that your negative indicates the existence of an element not found on this planet, you and your camera will go down in history.

Diffraction Gratings Have Other Uses

Like the photographic technician, astronomers, criminologists and industrial scientists use diffraction gratings to analyze unknown materials. The astronomer shoots a new star through a grating to discover its composition. The FBI agent puts a bit of the dead man's cuff in the crater of an arc light and studies its spectrum.

You don't need a Videon Stereo camera to

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join the saucer hunt. Any stereo camera will do. In fact, when I phoned the Pentagon to inquire whether the Air Force would be interested in photos taken with single-lens cameras, I was assured that *any* shot of a flying saucer made through a diffraction grating—even with a box Brownie—would be more than welcome.

You can get replica gratings from the Central Scientific Co., 441 Clinton Avenue, Newark, N. J. For a small lens with front opening no greater than 20 mm., order their grating number 86705, with a ruled area 20 mm. by 22 mm. on a two-inch-square glass. It costs $3.53. For larger lenses, they have grating number 86706, with a ruled area of 60 mm. by 70 mm. on a 82-mm. by 100-mm. glass, for $12.83. The pictures show you how to mount your grating.

A few general suggestions. First off, remember a flying saucer won't wait. Have your camera loaded and ready, tripod-mounted if possible, focused at infinity. Use panchromatic film. The highest shutter speed consistent with good exposure will help freeze your saucer.

Experiment to Get Exposure

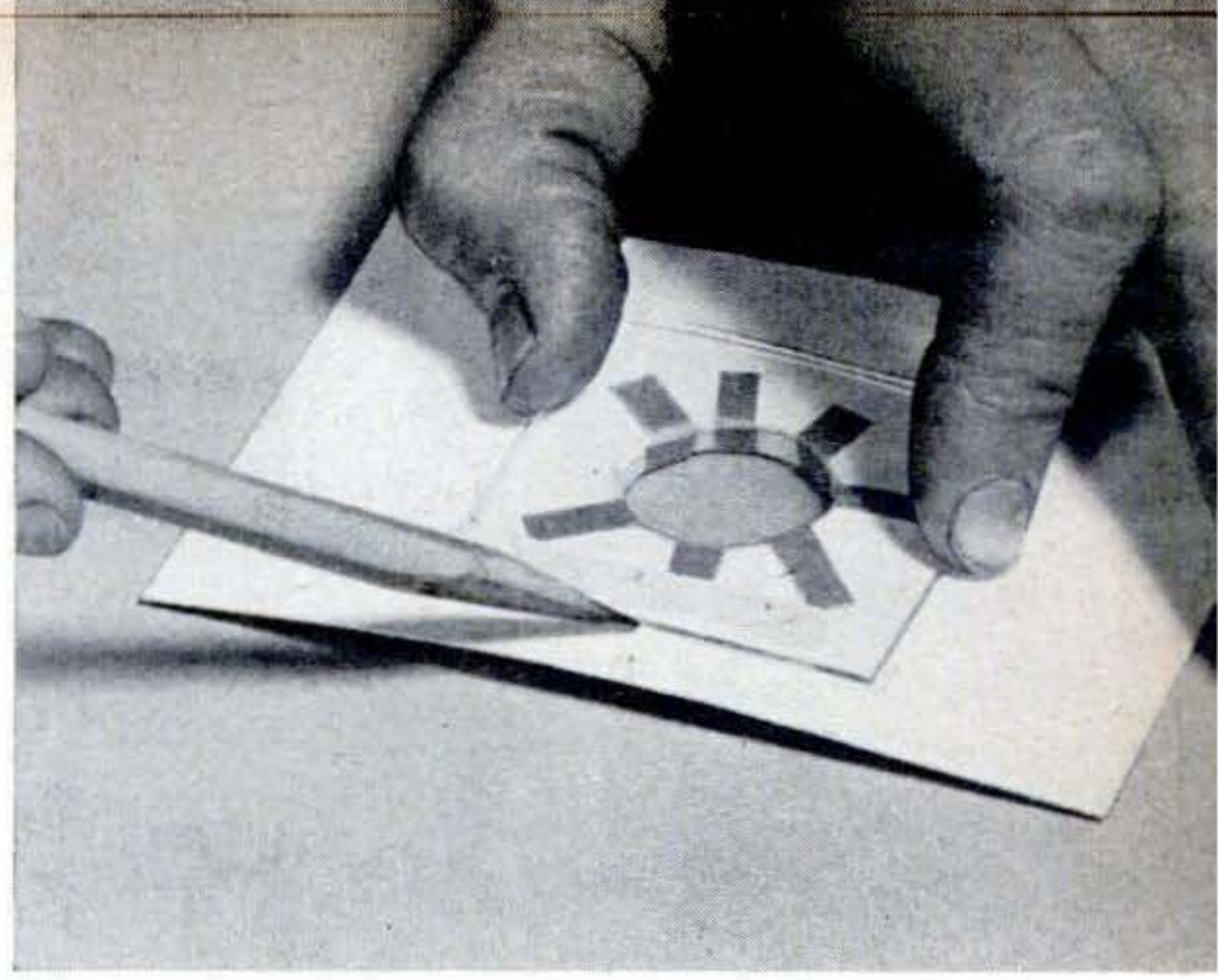
The problem of what exposure to use is tricky. It is impossible to give a general prescription suitable for both a dark object in a cloudy sky and a shining fireball at night. Perhaps the best idea is to experiment with such readily available light sources as the moon, Venus, neon lights, sodium arcs, incandescent and fluorescent lamps. (Just for fun, try a few color shots.)

In daylight hours, set your camera for prevailing weather conditions. At night the lens should be wide open and the shutter at 1/25 second. If your saucer is brilliant, you can stop down your lens and speed up your shutter in a hurry.

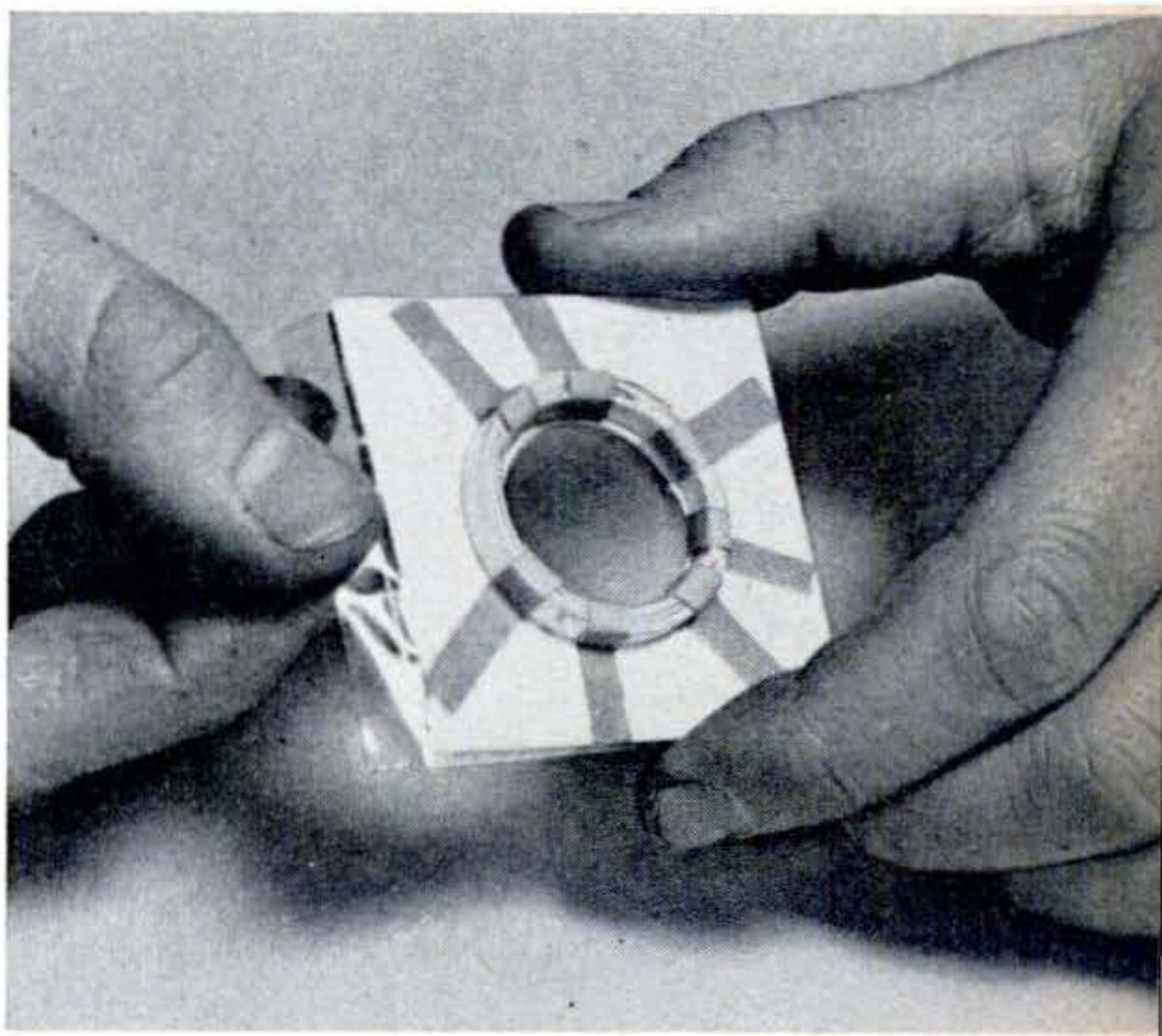
It will help the Air Force to determine the size and elevation of the saucer if you can manage to include a landmark such as a tree, house or telegraph pole in the picture. After shooting, mark the spot where you stood, or measure it off in two directions and write down the measurements.

Don't develop the film. Make a note of the lens and shutter speed, describe the conditions under which you shot the picture and mail this data and film to:

Air Technical Intelligence Center
Wright-Patterson Air Force Base, Ohio
Attention: Unidentified Aerial Objects Investigation.



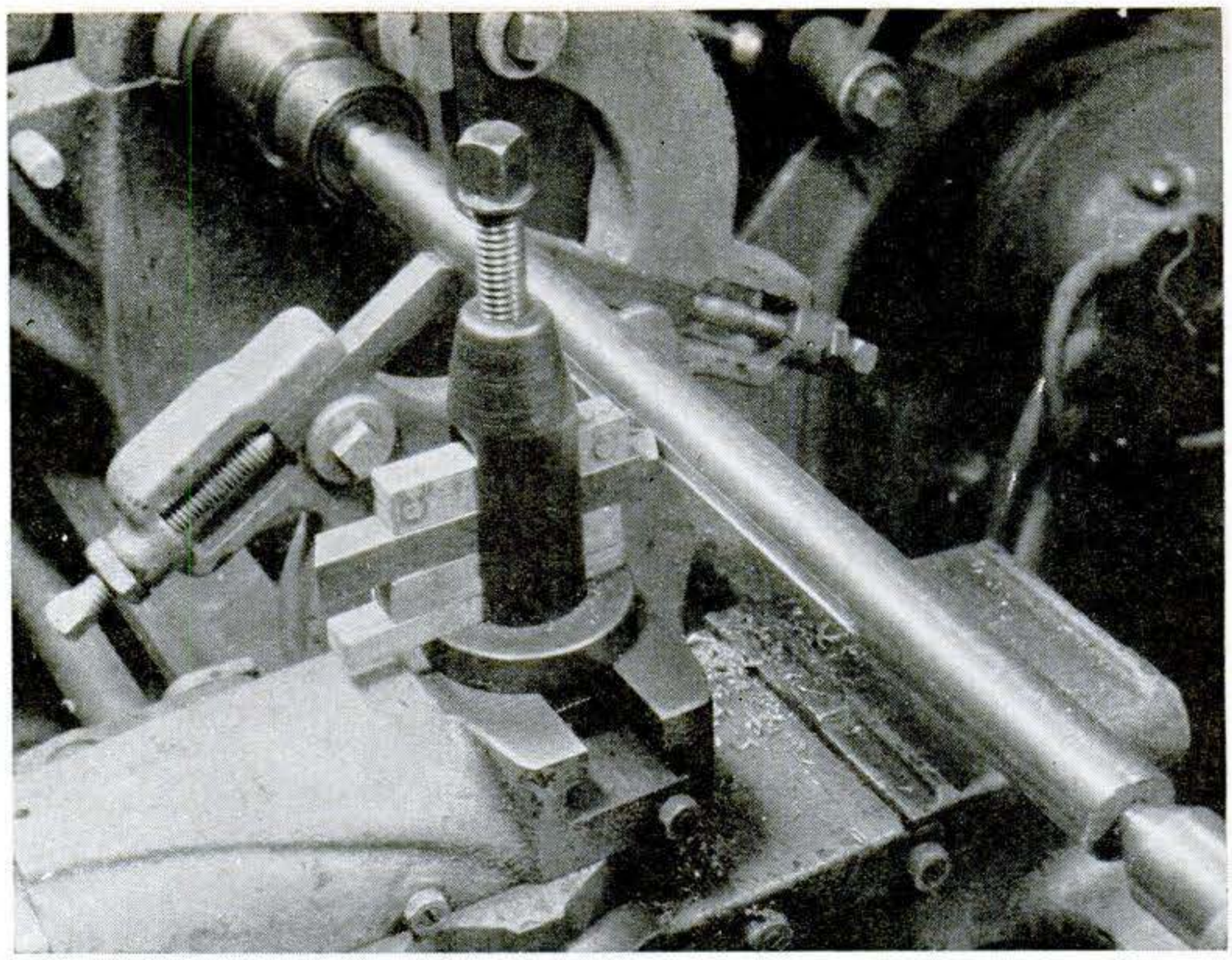
4 CENTER THE GRATING face up on flat side of card over hole. Trace around glass and cut card to size. Cut second card just like first.



5 NOW BIND GRATING between the two cards with Scotch tape. When grating is on camera, only plain glass is presented to weather.

6 MOUNT GRATING with lines running up and down. Aim so the subject is offset near side of field, to avoid cutting off the spectrum.

NEW Shop Ideas

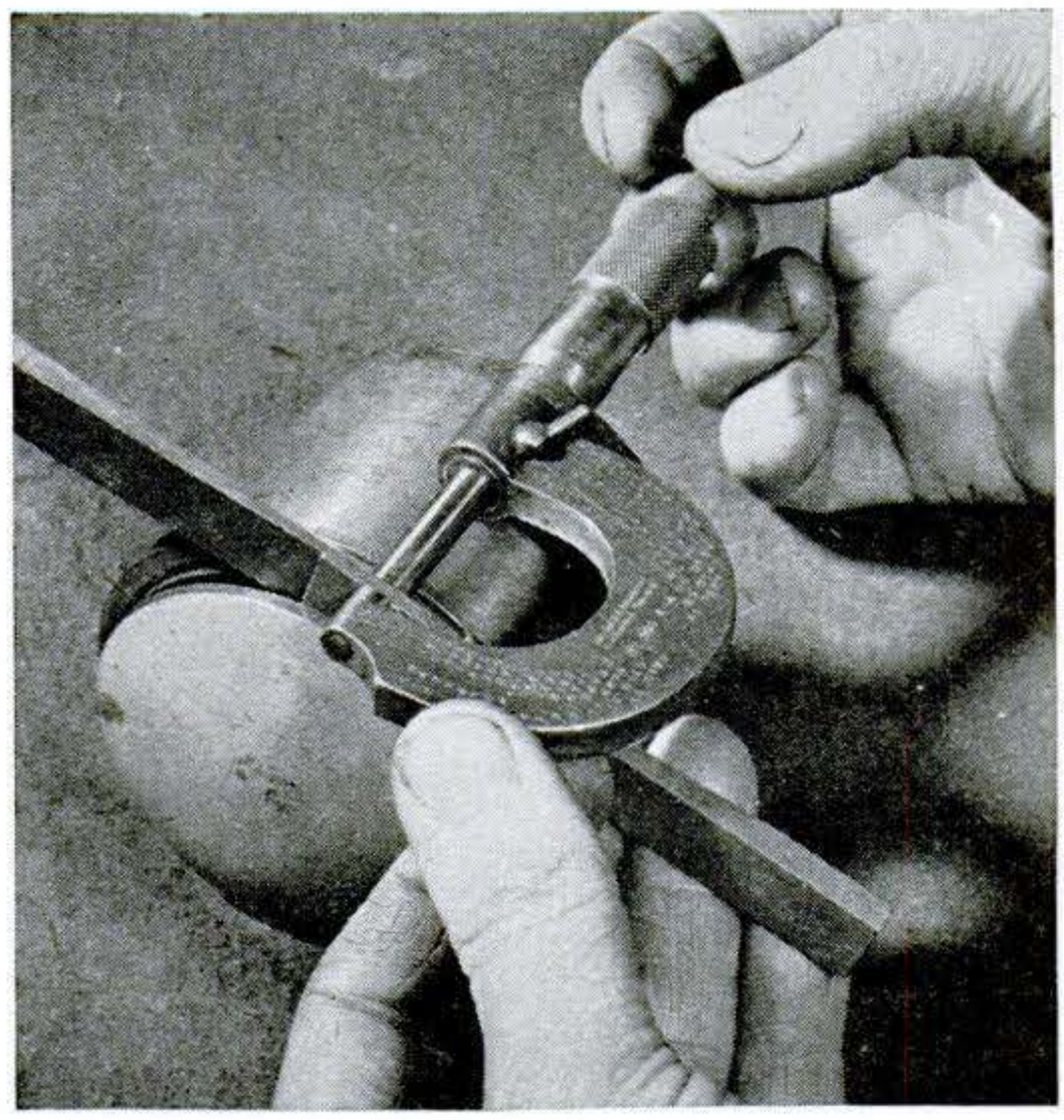


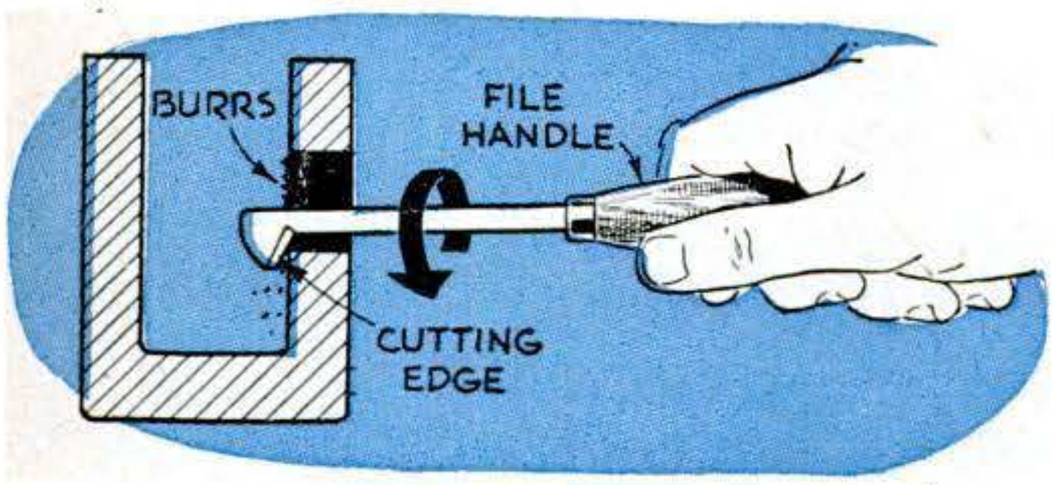
Lathe Cuts Keyways. Long keyways, often longer than could be cut with a milling attachment or small milling machine, can be cut in any lathe having powered carriage feed.

The shaft is mounted between a ball-bearing center in the headstock and a solid center in the tailstock. A steady rest is clamped tightly on the shaft to prevent it from turning while the back gears drive the carriage along the bed ways. A cutter bit, ground to the exact width of the desired keyway, is clamped on its side in the tool post, level with the center of the shaft.

Take light cuts at medium feed with your hand on the lead-screw engaging lever, releasing it if the tool hogs in to avoid straining the lead screw.—*Will Thomas, Buffalo.*

How to Check Shaper Table. To test the accuracy of a shaper or milling-machine table, set up a fairly long piece of bar stock on parallels and make a surfacing cut along its length. Then remove the work piece, turn it end for end and remount it on the parallels. Set up a dial indicator on the tool holder or milling arbor and pass it over the piece to determine the runout.—*F. Strasser, Santiago, Chile.*





Tool Removes Inside Burrs. When you drill through tubing or across grooves, burrs often build up on the inside surfaces where they cannot be reached with ordinary tools.

This tool, which you can grind from a narrow file or an old boring tool, will reach inside to get the burrs off. The hooked end of the tool is inserted, pulled back and turned.—*W. Walkinshaw, Whittier, Calif.*

Steel Wedges Mike Grooves. A pair of ground steel wedges will deliver the width dimension of a piston groove out to where the micrometer can read it. The tapered faces of the wedges are slid against each other in the piston groove until they stop. An accurate reading of groove width can then be taken off the parallel outer faces of the wedges.—*F. McGuckin, Ridgewood, N.J.*

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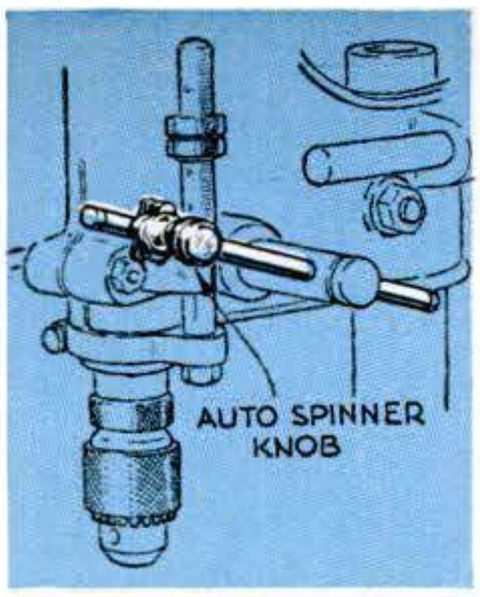
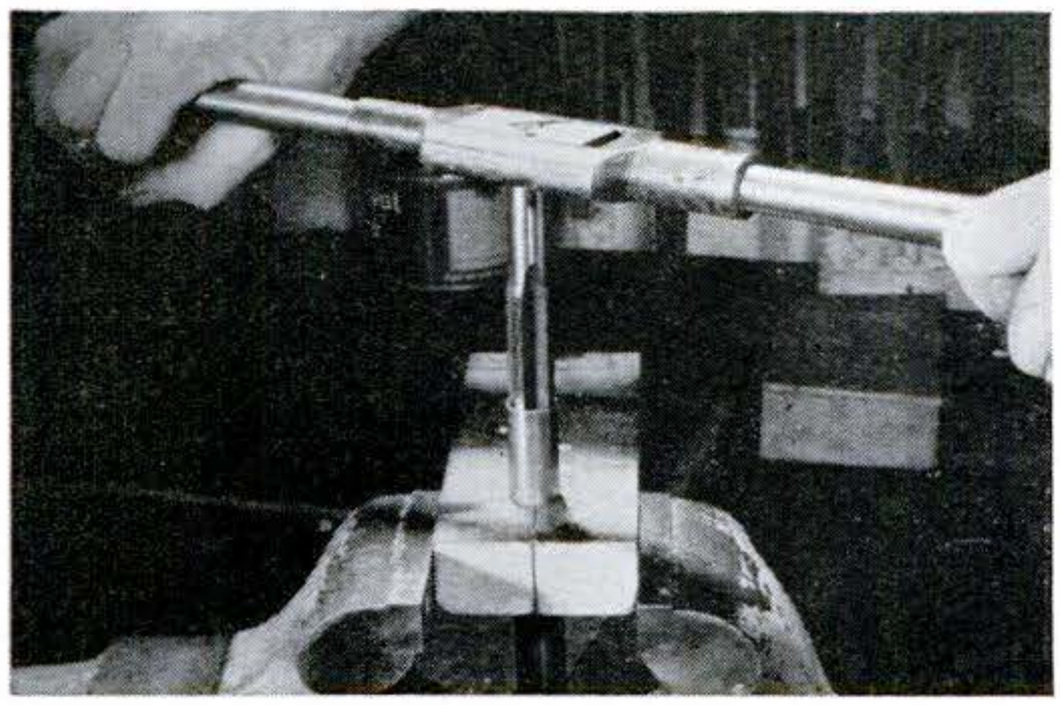
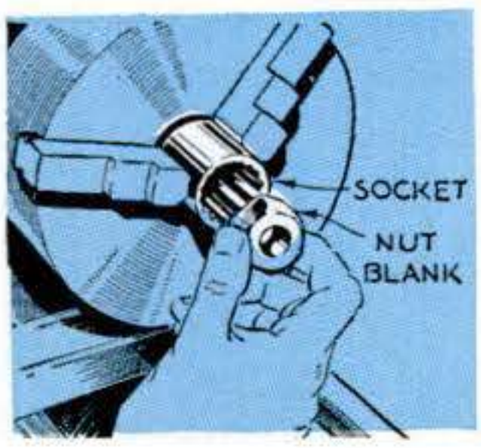


Spinner Aids Quill. A steering-wheel spinner knob, obtainable at any auto-supply store, helps in drilling deep holes in the drill press. It is especially handy on drills having a single feed handle as the swivel action of the knob makes it unnecessary to change the position of your hand as you force the drill down into the work.—*Victor H. Lamoy, Upper Jay, N.Y.*



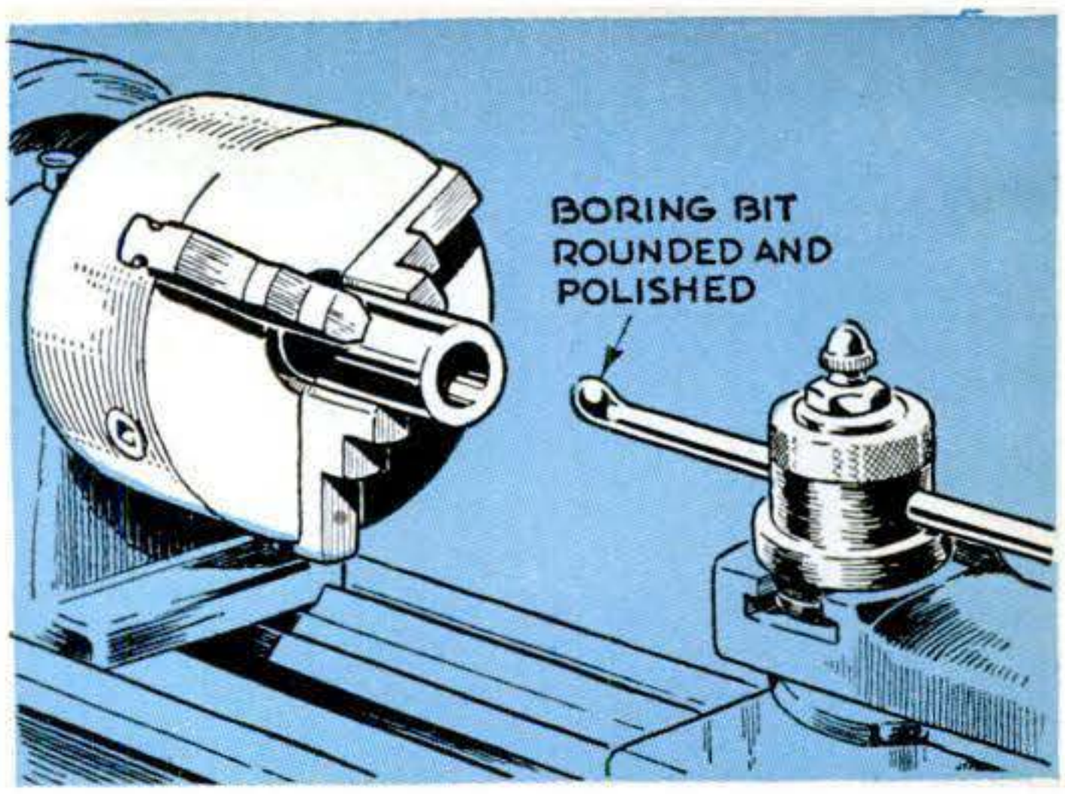
Tubing Held Safely in Vise. A piece of scrap wood drilled and slotted through the hole will make a crude collet to hold light tubing between the jaws of the vise without crushing it.

The hole should be the same size as the tubing to be held.



Socket Chucks Nuts. A 12-point socket from a mechanic's wrench set can save plenty of elbow twisting when making up nuts from hex rod.

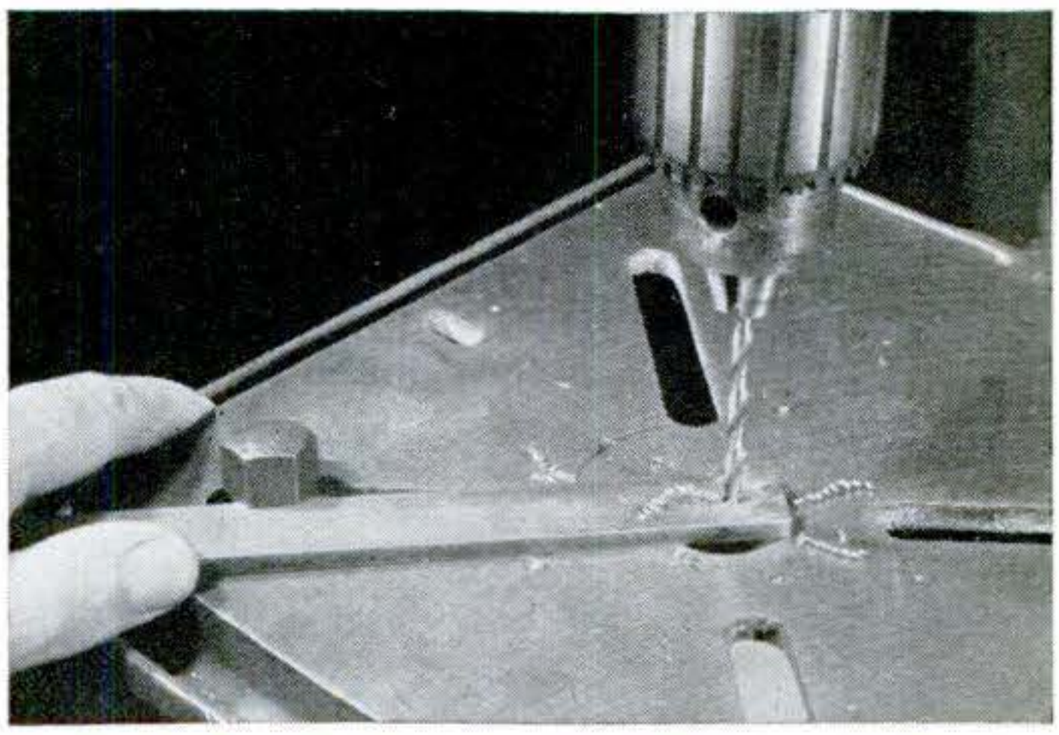
The rod is first drilled to tapping size and the blanks cut off in the quantities required. Then the socket is chucked in the lathe and the nuts slipped quickly into it for tapping. The tailstock is pushed along the bed by hand to bring the tap up to the nut and pressure is maintained until the tap cuts the full thread. Then the lathe is reversed to allow the threaded nut to push the tap and tailstock back out. The finished nut is removed and the next blank inserted as the lathe is stopped and started forward again.—*R. Carlson, Vancouver, B.C.*



Burnish Bushings for Longer Life. To reduce running-in time and make bearings last longer, try burnishing them when you bore them out.

Immediately after the finishing cut, and using the same feed but a slightly slower speed, run a carefully rounded and polished boring-bar tool bit through the bore. Moderate pressure of the polished tool bit burnishes the bushing, leaving a smooth, highly polished, work-hardened surface that will hold its fit long after other bushings have become sloppy.

Very small bearings can be burnished by running a piece of hardwood with a ball-shaped end through the bore by hand at low speed. The hardwood ball should be a tight fit in the bore.—*Fred F. Davis, Edmonton, Alberta.*



Bolt Adds Safety to Drill Press. A large bolt inserted in a slot in the drill-press table may save you the frightening experience of having a job spun right out of your hand as the drill bites into the metal.

The bolthead prevents the piece from riding up and over while the shank, slightly smaller than the width of the slot, holds the work against the twisting action of the drill. No nut is needed and the bolt can be quickly removed when not in use.

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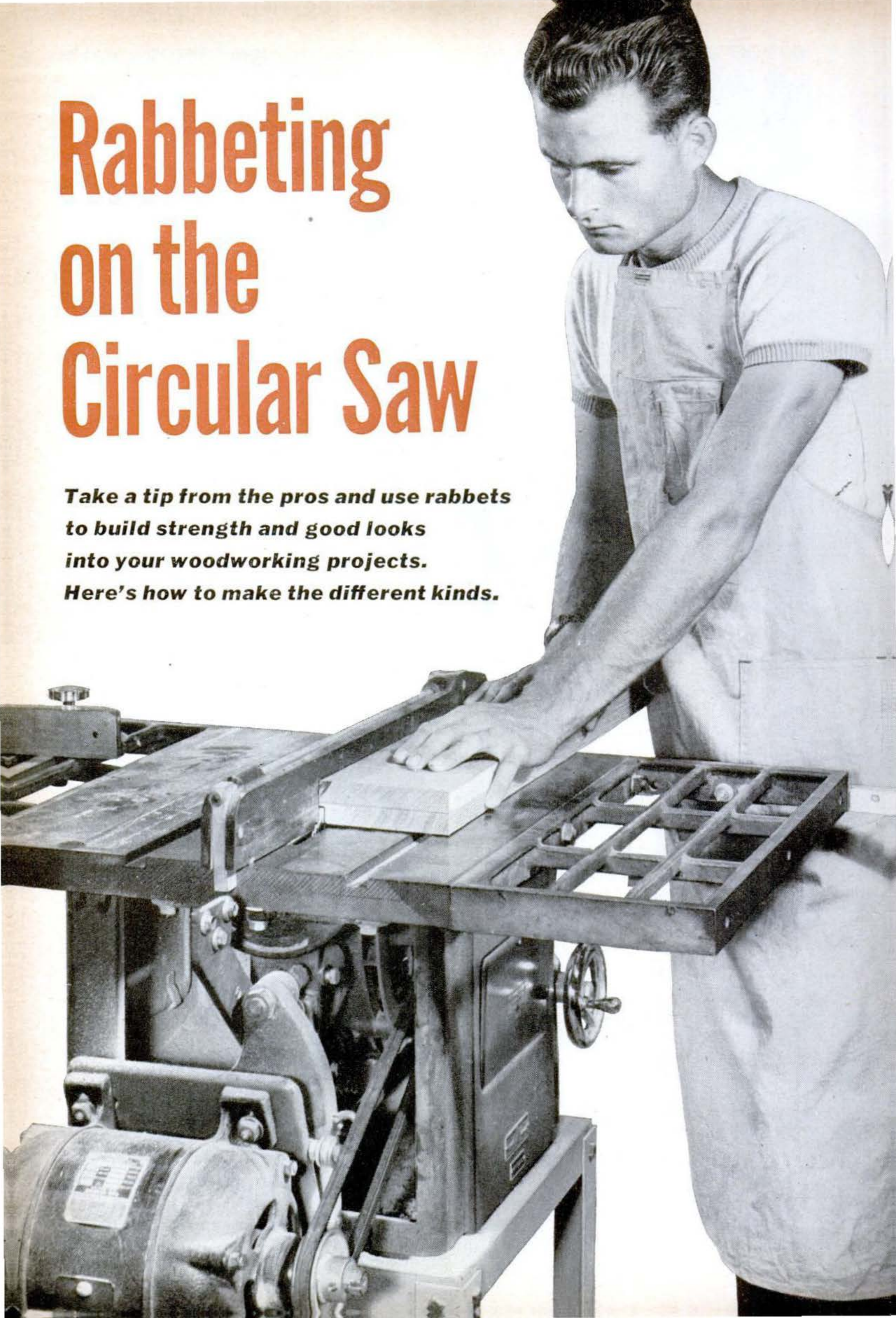
Rabbeting on the Circular Saw

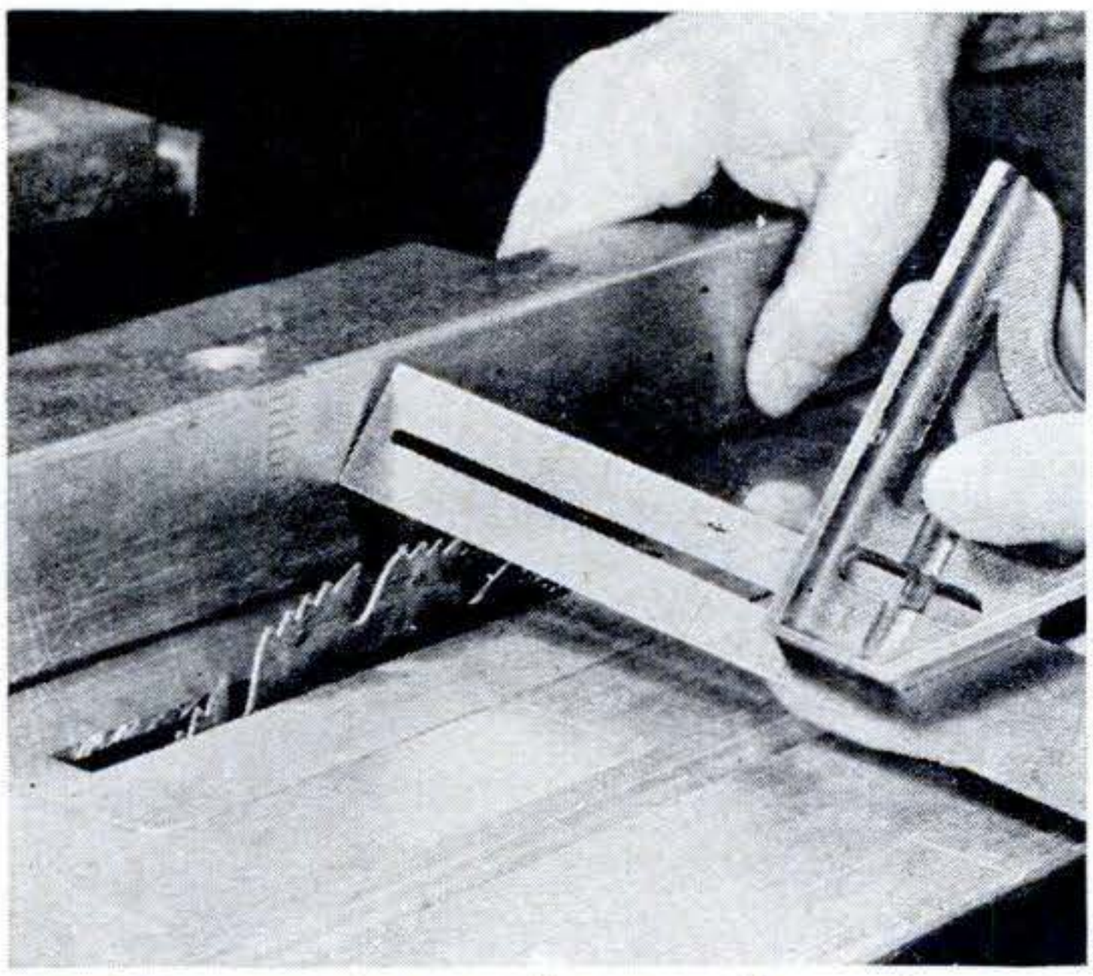
Take a tip from the pros and use rabbets to build strength and good looks into your woodworking projects. Here's how to make the different kinds.



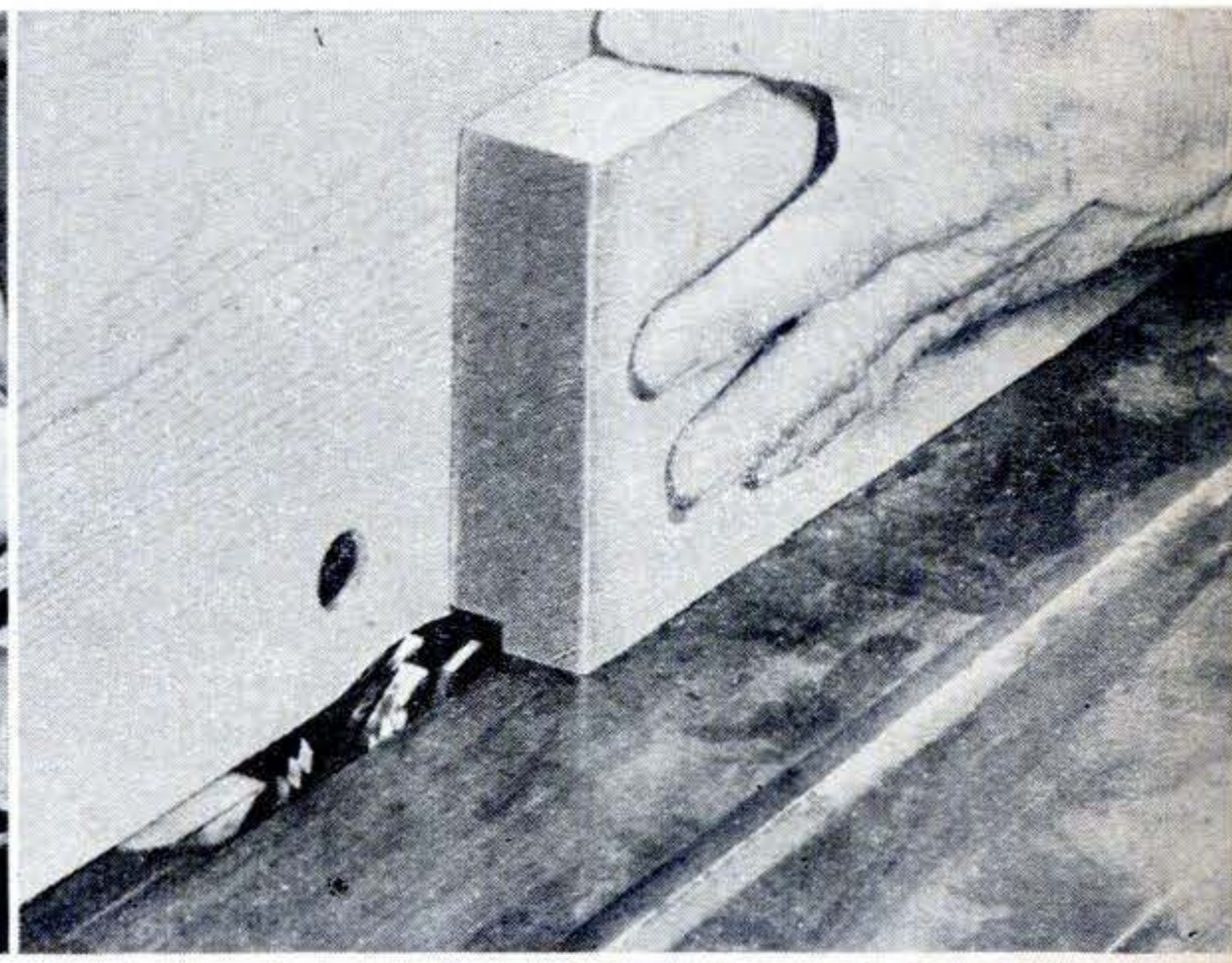
By Edwin M. Love

A RABBET is a step cut into a board. It is one of the best ways of connecting wood to wood or to other material. In a joint, it brings six surfaces together for gluing instead of the butt joint's two. For house siding, it makes a weatherproof as well as decorative joint. In sash frames, it receives the glass. In cabinetwork it is indispensable for concealing corner joints and for all-around strong construction.

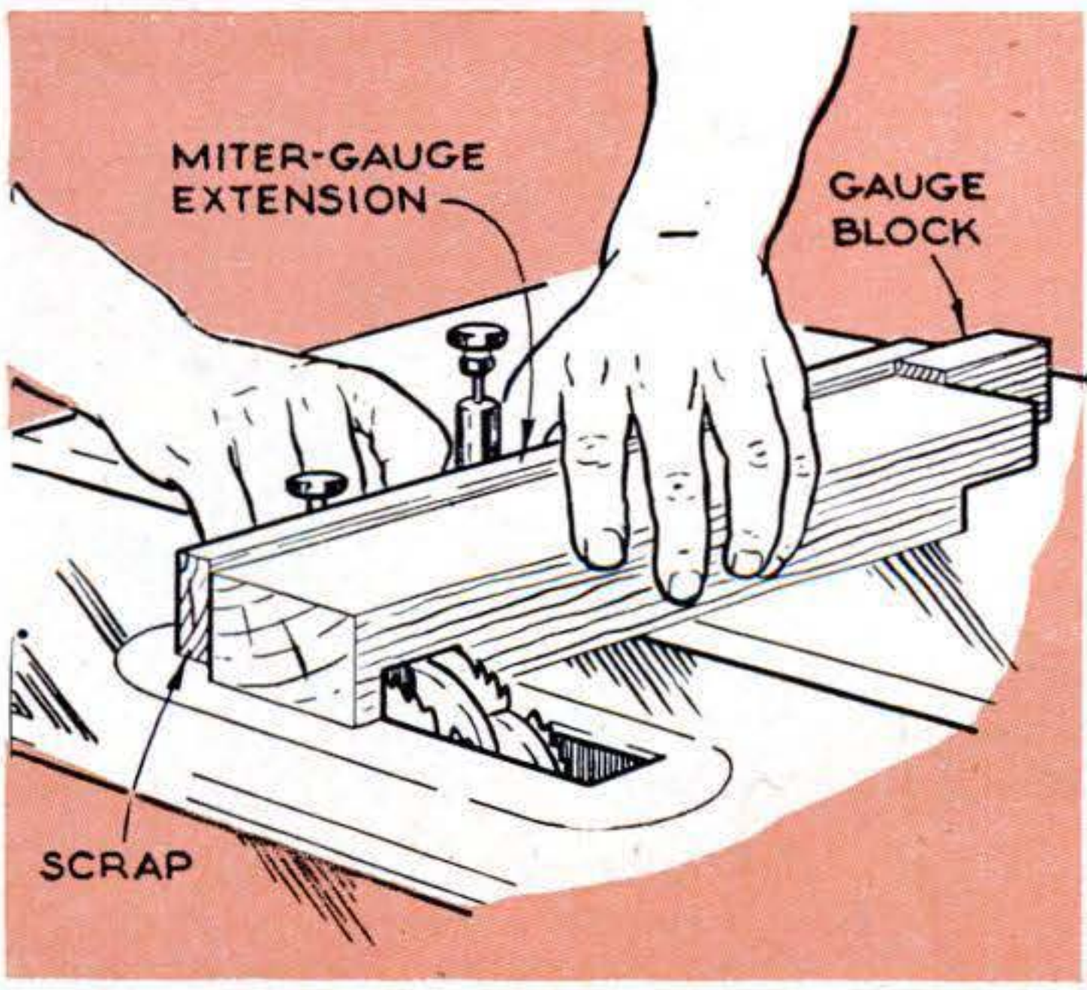
You can cut rabbets with your circular saw just as it is—just make a double cut to remove a rectangular strip from the edge of a board. A dado head or set of wobble washers, though, will cut a rabbet in one pass. Either also guarantees a sharp inside corner, not always obtained with the ordinary saw blade, which requires the depth of cut and rip fence to be set precisely to avoid undercutting the corner on the second pass. The following photos give further dope on the care and feeding of rabbets.



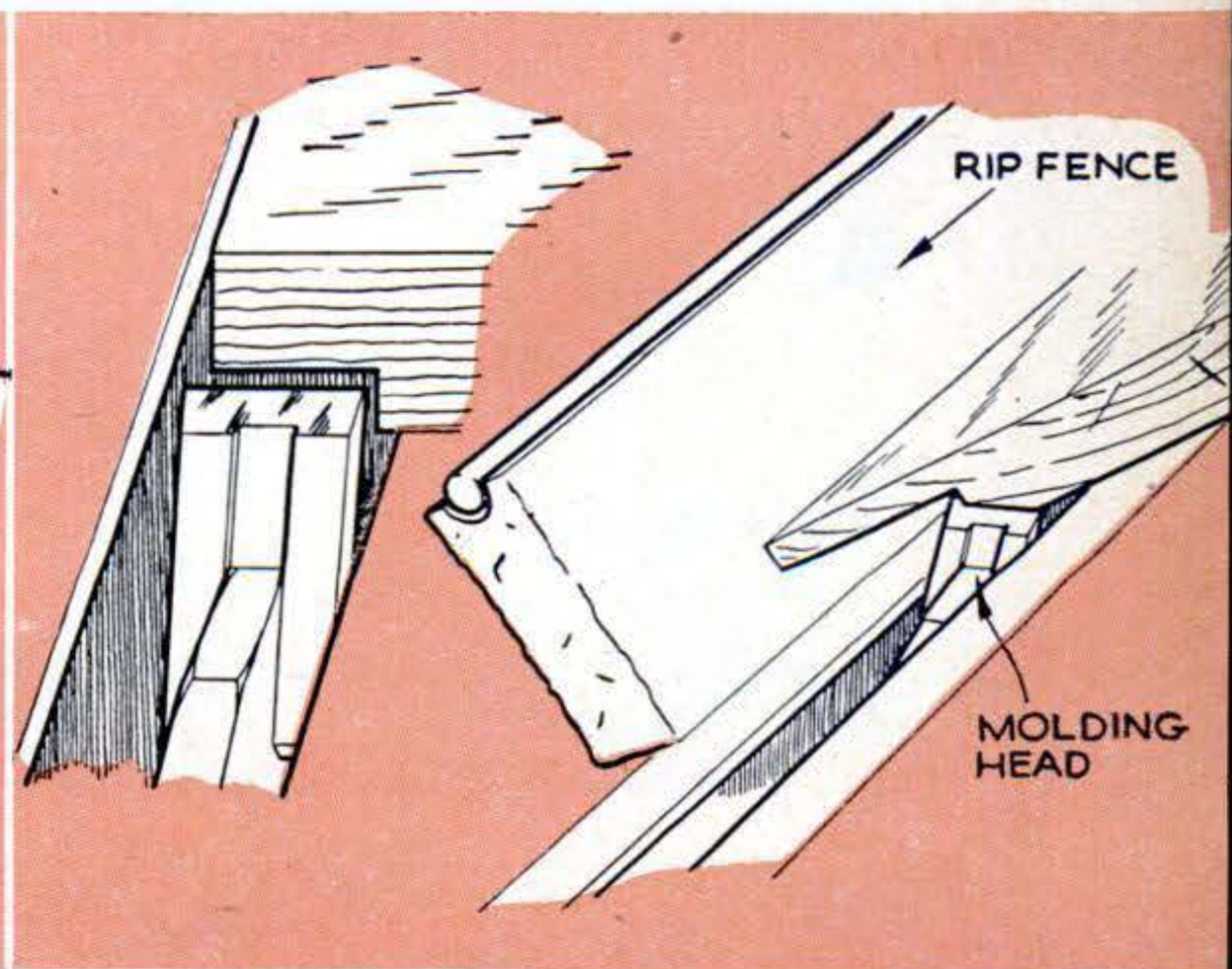
Combination blade is all you really need to cut rabbets on your circular saw; two passes over the blade do the job. The trick is adjusting the fence and blade height to the depth of the rabbet. Only if these adjustments are correct will you get a crisp corner.



Dado head can cut a rabbet of standard width in one pass. Bolt an auxiliary fence to the rip fence and cut into it so that only the required width of the dado blades projects. Wide rabbets are cut by making several passes over the fully exposed dado head.



Cross-grain rabbets are best cut by backing up the work with scrap wood to prevent blade from tearing wood at end of cut. For repeat operations screw a gauge block to the wooden miter-gauge extension to locate pieces of same length for rabbeting.



Molding head with square cutters cuts smooth-bottomed, clean rabbets. It is used like a dado head. At right, molding head bevels a siding board already rabbeted. Arbor or table is tilted and trial cuts made to locate fence.

Please turn the page.

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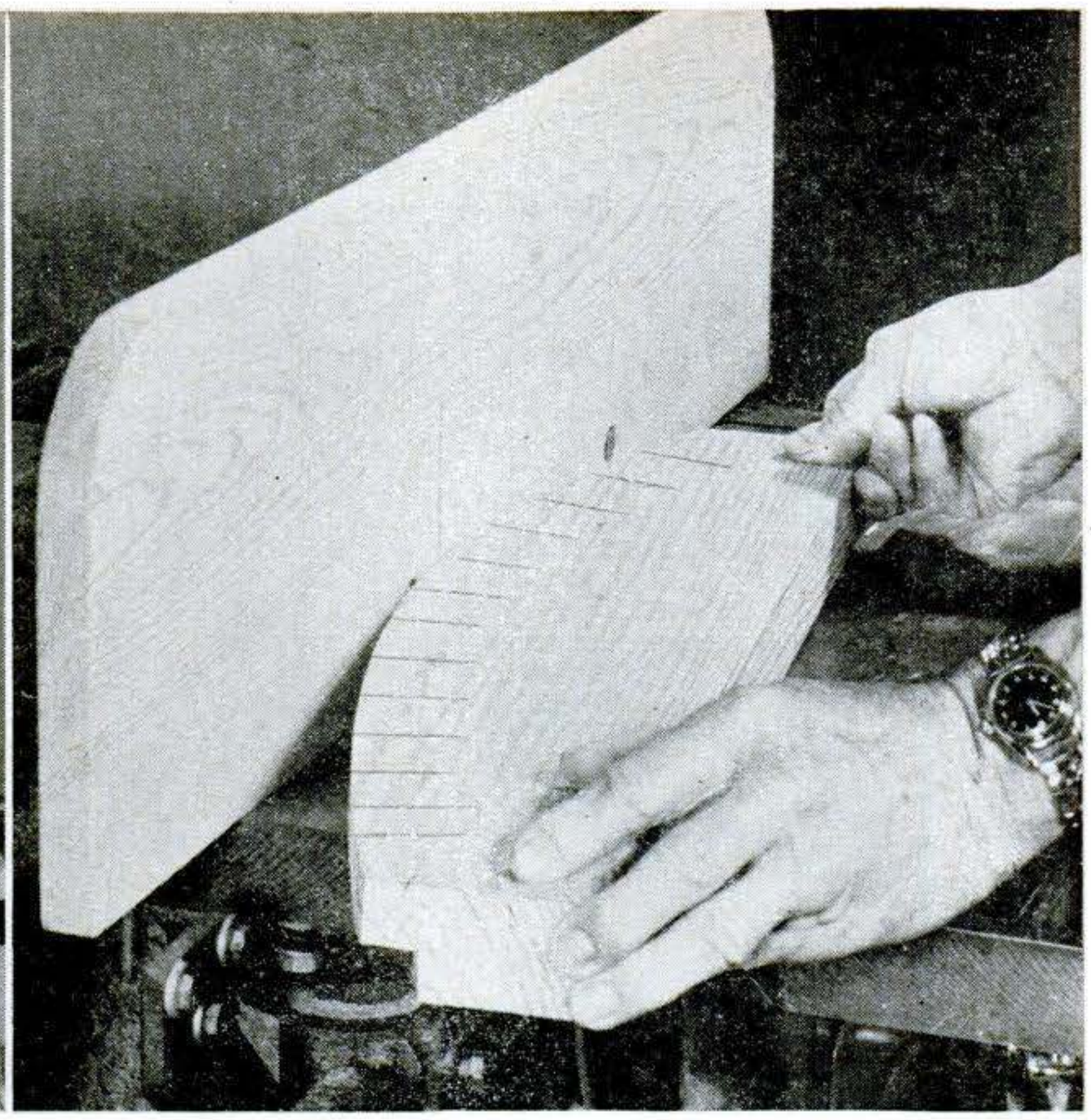
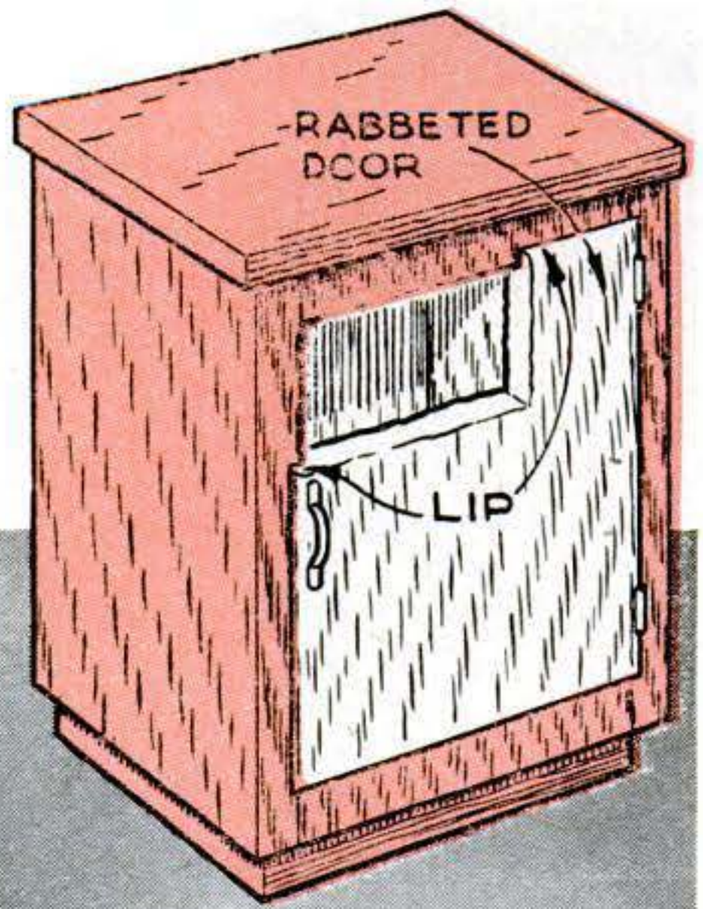
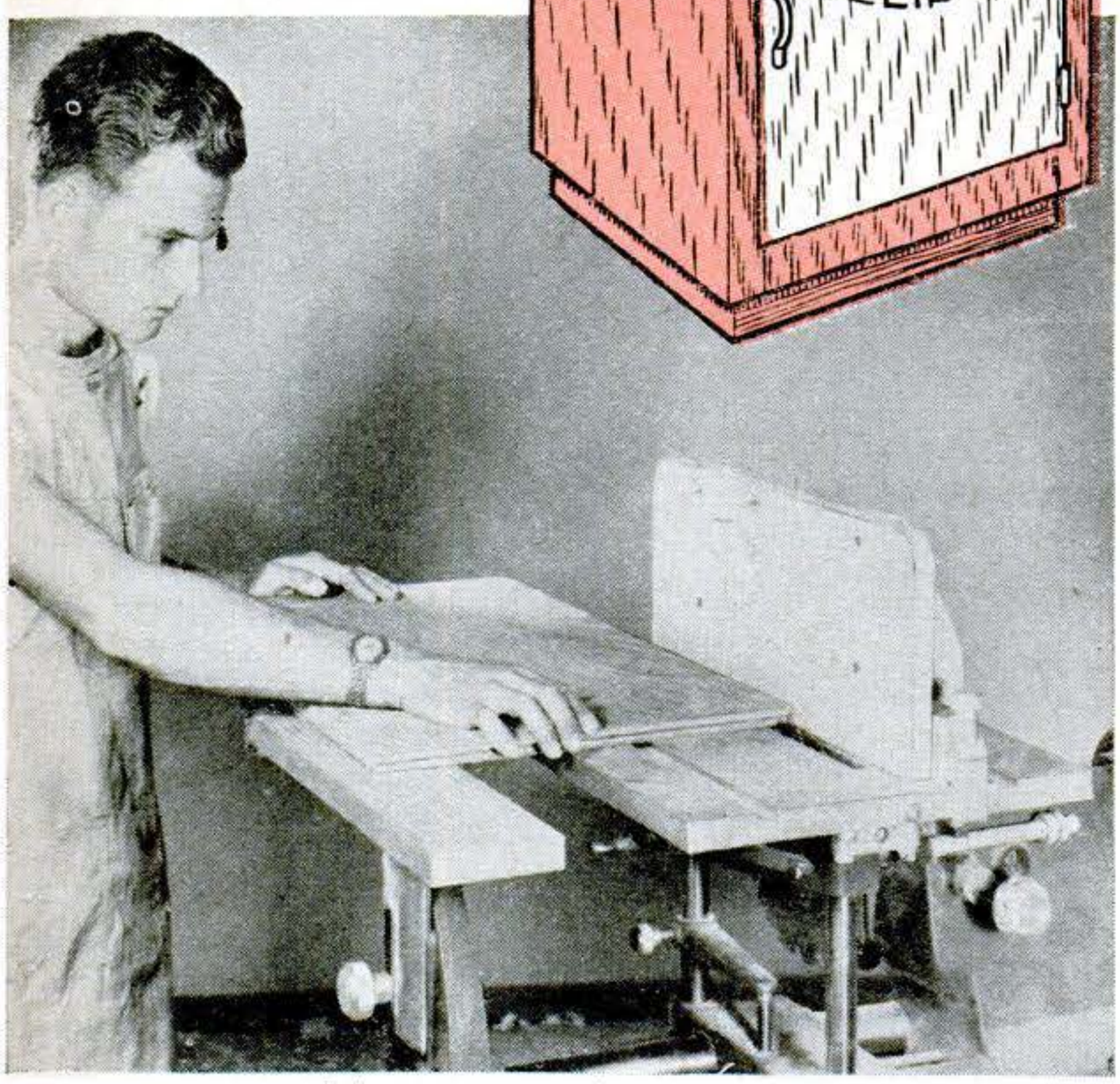
Blind rabbets are closed at one or both ends. Work is lowered onto blade and advanced until it meets stop clamped to fence. Round ends of cut are then chiseled out square.

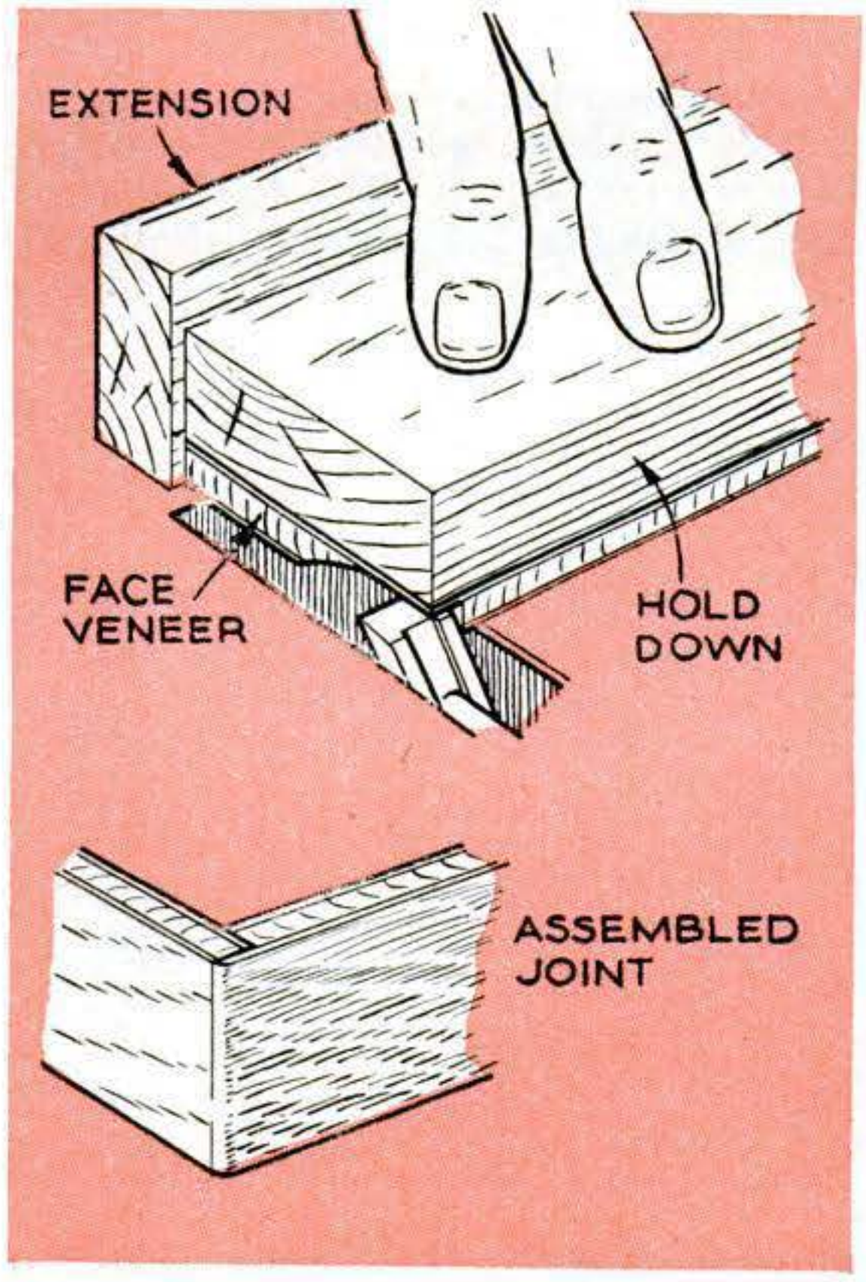


Outside curves are rabbeted with dado or molding head by running edge against fence. Center of cutter is marked on fence and radius lines on work are aligned with it successively.

Lip door, rabbeted all around, is carpenter's favorite for cupboards. Time is saved by making the rabbet ½" by ½" which permits sawing both sides at one setting. High fence holds door steady for second cut of rabbet.







Box or cabinet corners, if constructed of veneer panels, can be almost completely concealed by rabbeting right up to the face veneer. Use a block over the panel while cutting to prevent the veneer from lifting off. After assembly trim off the projecting edge and round the corner. This type of corner should be glued.

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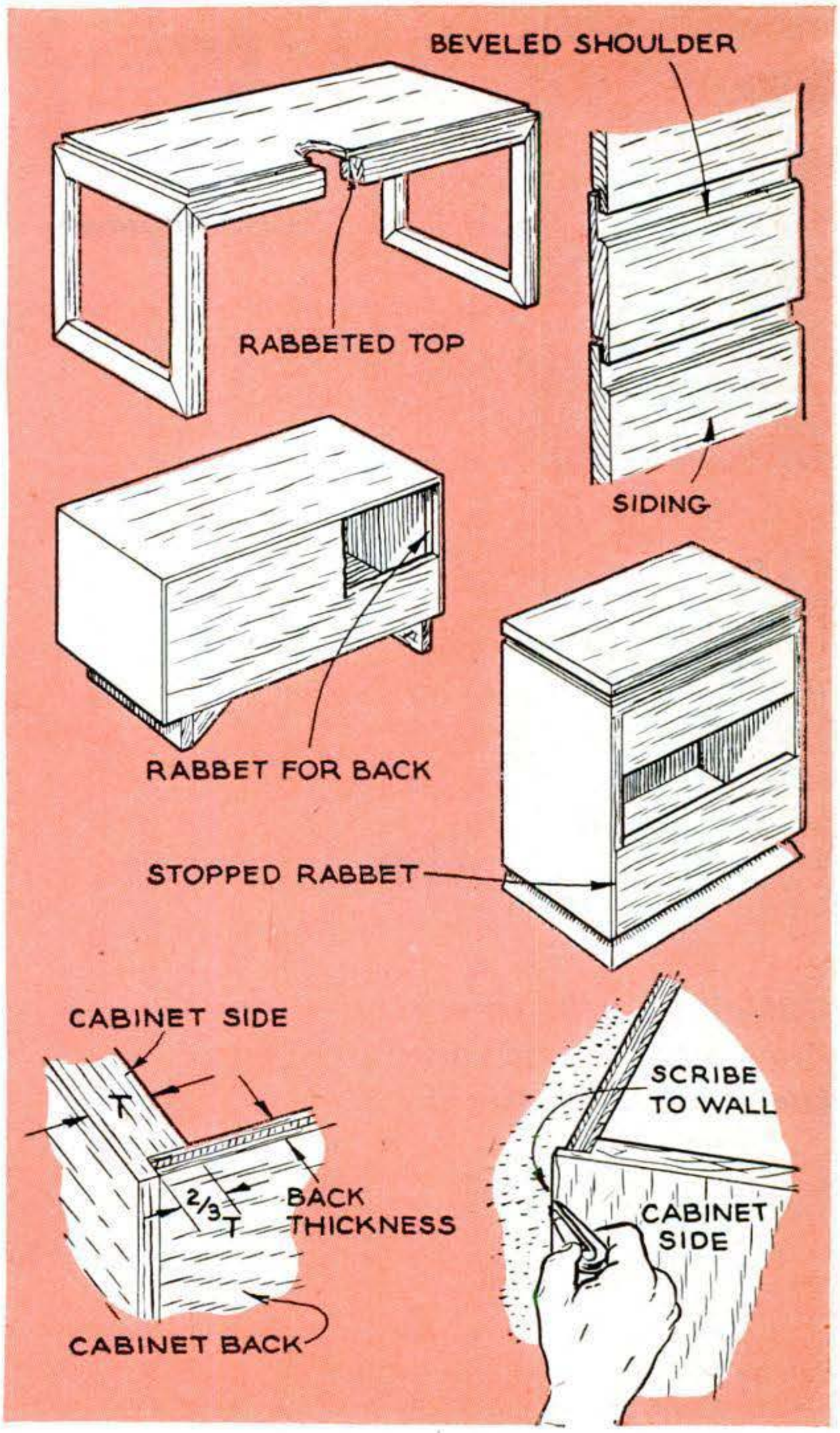
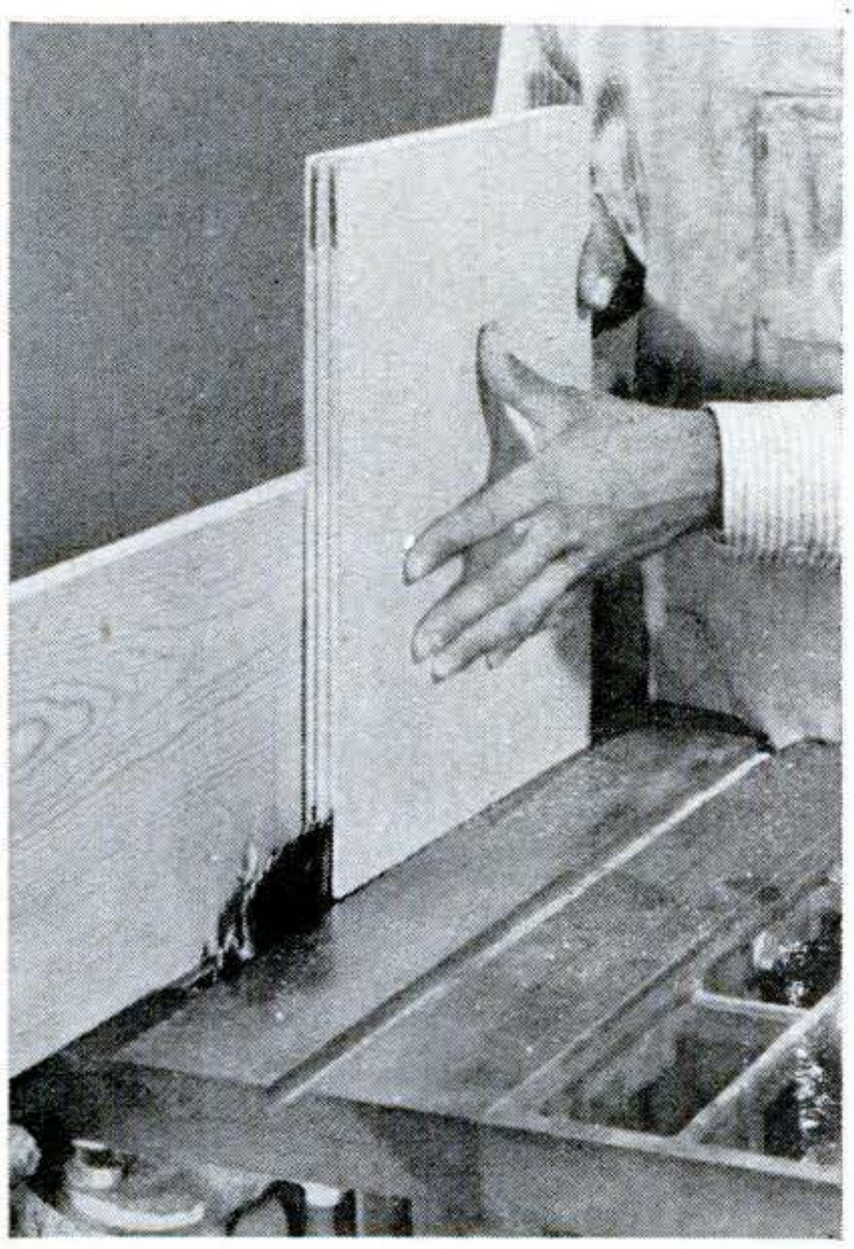
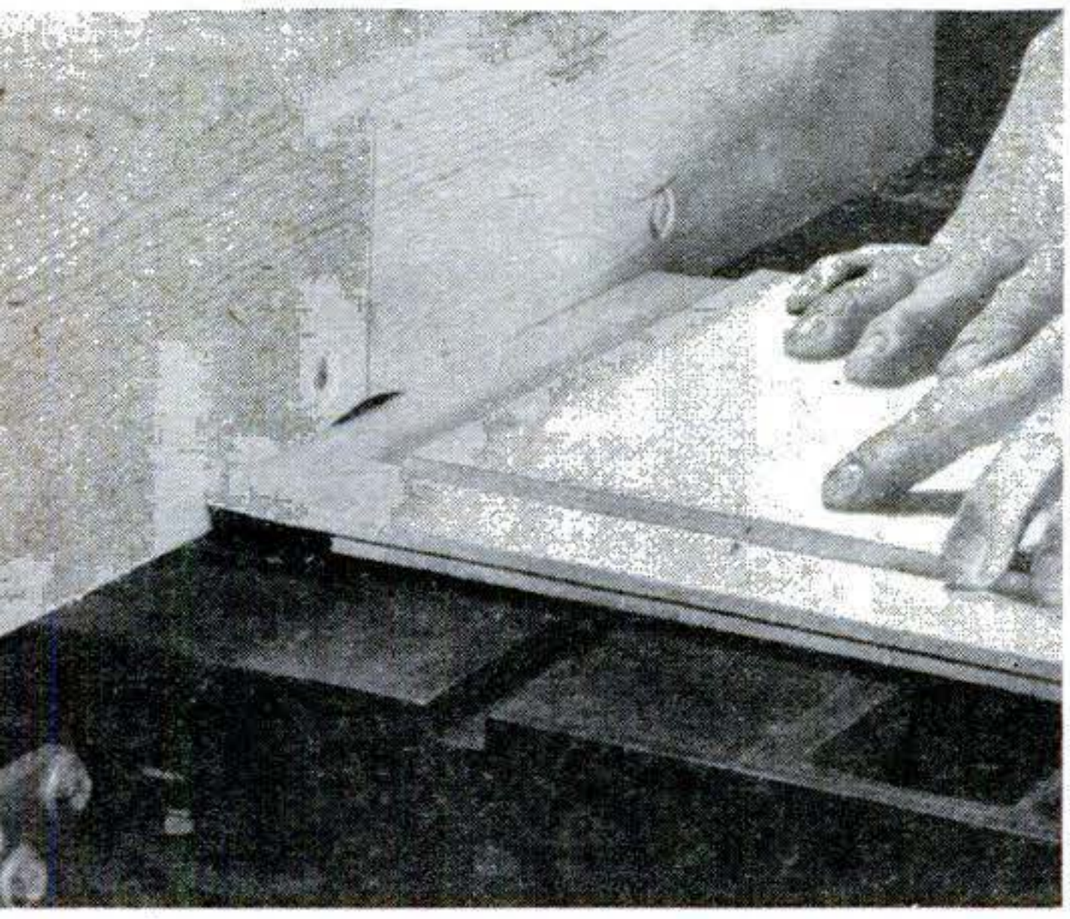
Most common rabbets. Frame of coffee table at right is rabbeted to receive table top. Siding takes full advantage of rabbets to form weatherproof joint. At center are two methods of fitting backs into cabinets with rabbets. Note that rabbet is usually cut about two-thirds into the thickness of the wood. When cabinet is to fit against a wall, rabbet is cut extra deep and projecting edge shaped to fit contour of wall (bottom). Cut extra deep if wall is irregular.

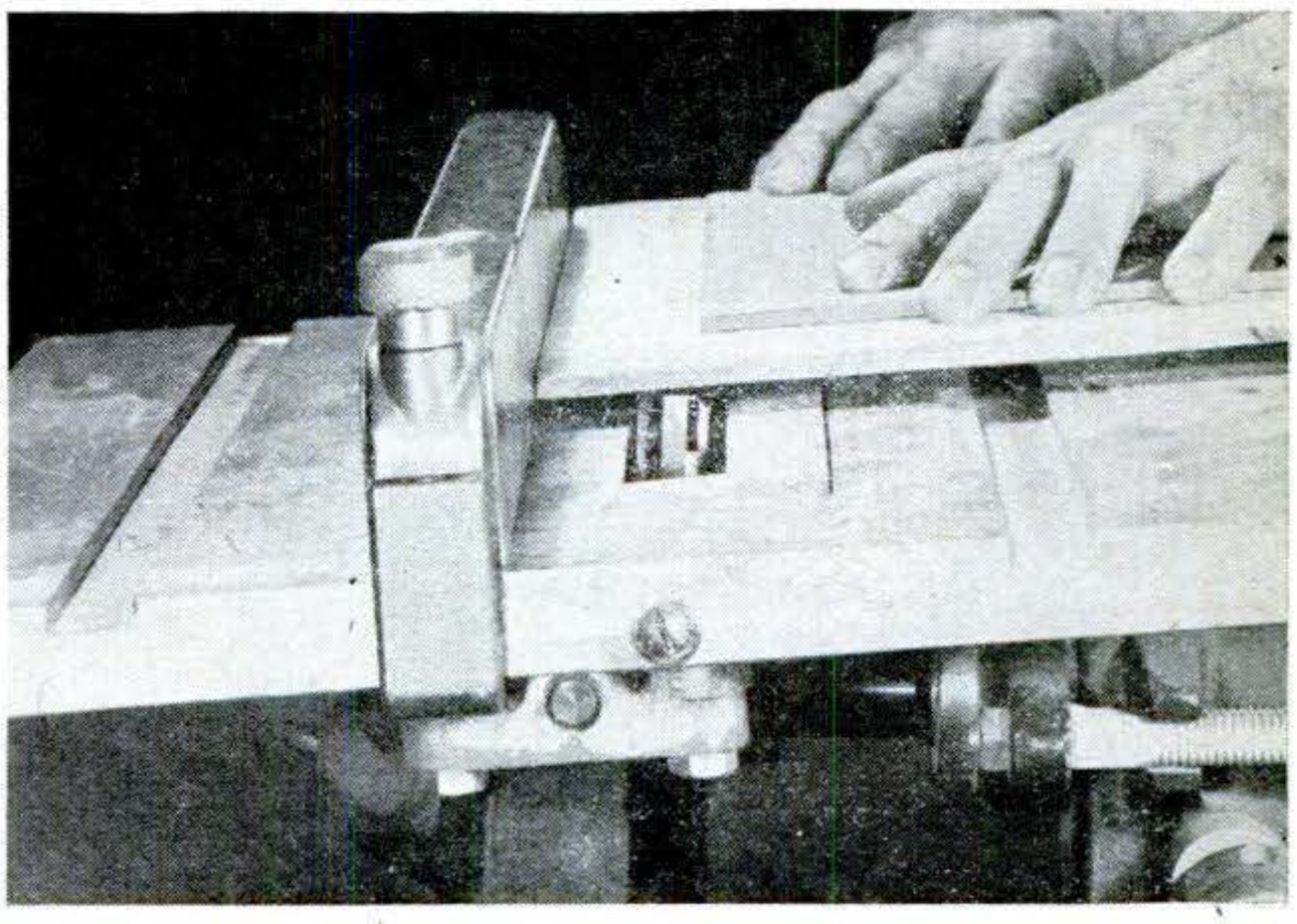




Raised panels such as those used in traditional furniture are among the many decorative uses of rabbets. Saw all around the piece on both sides with the blade set at an angle to bring out a slight taper.



Panel is finished by trimming original cuts with blade set carefully to proper depth. Sand off slight unevenness where blade crossed last cut made. Also sand corners of raised surface.



Dado or molding head can be used to cut raised panel. Work is done entirely from face of piece. Tilt arbor for slight taper and cut shoulders first. Then shift fence and raise cutter to continue the taper to the edge of the work. Sand off slight difference between two cuts.

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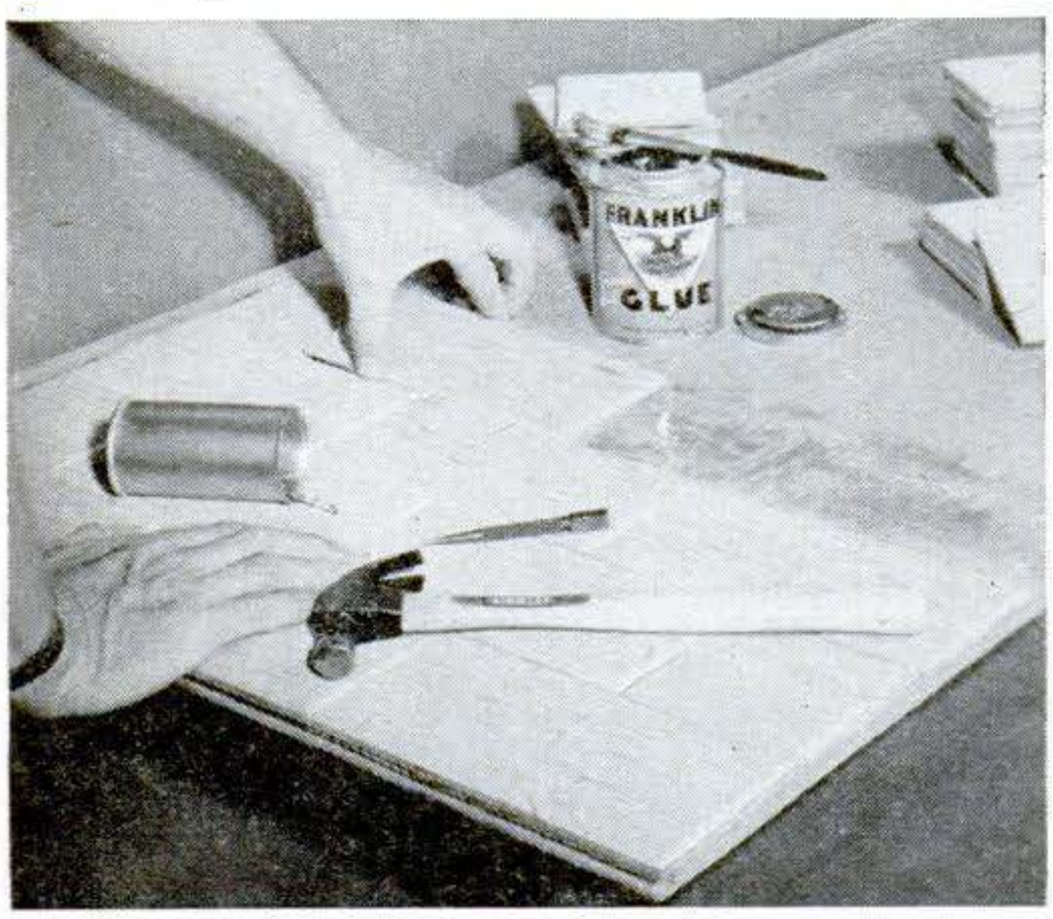
BEFORE **AFTER**

DRAB ENTRANCE HALL at left was broken up by sliding wardrobe panels and other doors that prevented using wall decorations. At right, striated-plywood tiles on sliding panels liven up hall without affecting use of doors.

Plywood Tiles Dress Up Dull Walls

Cut or bought in varied shapes, they make handsome designs that you just glue on.

OUR entrance hall was so dull that we considered letting the neighborhood kids draw on the walls to help liven it up. It consisted mostly of doors, especially two large sliding wardrobe panels—and you can't hang pictures on doors. Slapping on some bright paint would simply substitute garishness for dullness.



PLYWOOD TILES are glued on a row at a time and held in place during drying by small, countersunk brads. Tiles must be started square, kept tightly butted for a good fit.

Then we hit on the idea of covering the sliding wardrobe doors with striated-plywood tiles. These are easy to put on and provide a handsome design that relieves the monotony of the other areas.

Make them or buy them. You can save money by cutting the tiles yourself out of 4′ by 8′ sheets of 5/16″ Weldtex. But sawing them into accurate, uniform shapes and sanding the edges to a neat bevel take time and work.

You can trade a little more money for the luxury of laziness by using ready-made Striatile*, as I did. These are precut tiles that come with either straight or diagonal striations in a variety of sizes and shapes—4″ by 8″ and 2″ by 12″ rectangles, 4″, 6″ and 8″ squares, 4″, 6″ and 8″ hexagons—at an average cost of about 18 cents a tile.

Choosing a pattern. I decided on the 4″ by 8″ tiles laid in rows, but there's no limit to the designs you can work out. Using square tiles and alternating the direc-

**Woodcraft by Armand, 514 North Lafayette St., Allentown, Pa.*

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tion of the striations produces a checkerboard pattern. The diagonally striated ones will create a herringbone effect. The hexagons form a novel mosaic.

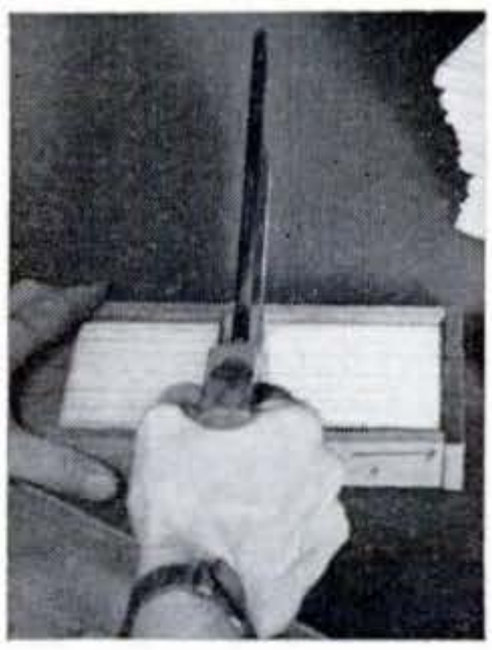
Doors aren't the only candidates, either. A small number of tiles will do a lot to brighten up a dull bed headboard, a plain desk or even a wastebasket. A few more will dress up the wall over the fireplace. Another trick, if you have a wall with bookshelves or other built-ins on it, is to cover only the areas around them. This will save a lot of tiles yet give the appearance of a paneled wall.

Mounting the tiles. Since I wanted the tiles laid with staggered joints like courses of brick, this called for half tiles at the ends of every other row. To cut them quickly and accurately, I rigged up a shallow, three-sided box just big enough to hold one full tile and sawed down the sides at the middle to provide guide slots. Then all I had to do was drop in a tile, make a couple of passes with the saw, and out came two neat half tiles.

Next I removed the doors and laid them flat. Starting at one end, I spread on a narrow strip of glue and put down a row of tiles, then a second strip of glue and another row of tiles, and so on until the job was complete. Small, countersunk brads hold the tiles in place and are easily concealed by the striations in the wood.

Fitting odd sizes. Patterns that don't come out exactly even at the edges should be centered so that the fractional tiles are the same size on both sides. Starting at the top of a door or wall will also make any odd-size tiles come at the bottom where they'll be less conspicuous.

We finished our tiles with two coats of water-white lacquer, which turned them to warm golden color. You could also paint them, but the natural finish is so handsome that I'll bet you won't want to.—*Paul Corey, Sonoma, Calif.*

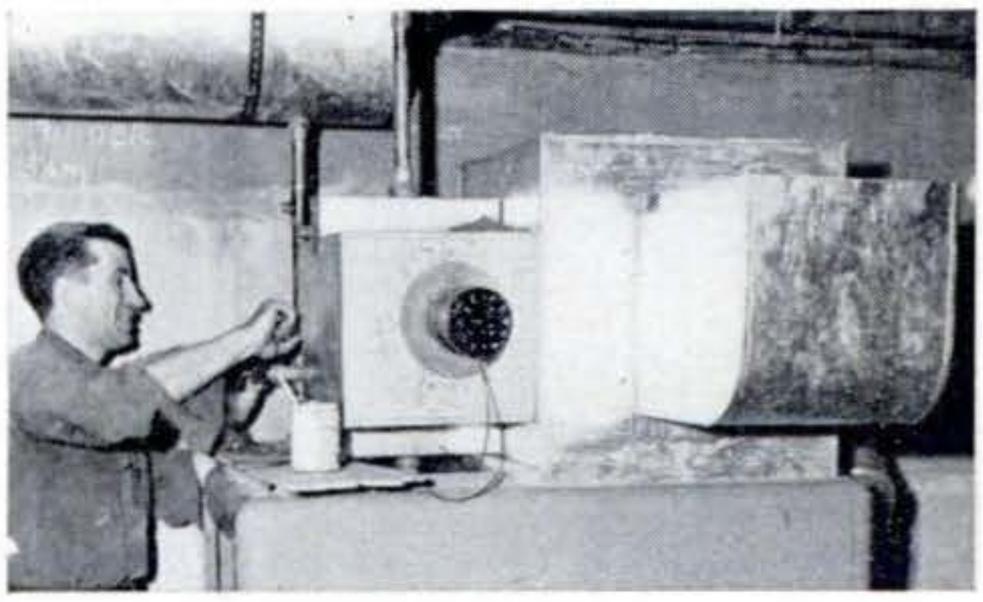


HALF TILES, needed to fill out ends of staggered pattern, are accurately sawed in shallow, three-sided miter box that holds one full tile and cuts it neatly into two uniform halves. Rough edges are then smoothed with sanding block, stroked gently at first to avoid breaking off the ridges.

Heat Ducts Are Flexible

GLASS-FIBER ducts make it easy to install modern warm-air heating in older homes. Only two small wall openings are needed—one at the baseboard level and the other 6′ above. The flexible tube is fed collapsed into the upper wall opening until it reaches the bottom opening. Inside the wall, the duct snaps back to shape to fill the stud space. Metal grilles are then placed over the openings. This method eliminates tearing out lath and plaster to install metal ducts. The units are part of a heating system made by Coleman Co., 248 N. St. Francis St., Wichita, Kan.

Water Heated by Hot Air



THE same hot air that heats your home also heats your hot water when this unit is used. A blower moves heated air over a finned copper coil that carries the water. In the summer, a damper stops hot air from moving upstairs. A 40-gallon water-storage tank is recommended for one-family homes. With a larger tank, some of the hot water can be piped to a hot-water radiator in a sun porch or garage. Made by Aqua-Air Corp., Elmont, N.Y., the unit can be mounted on any hot-air furnace.

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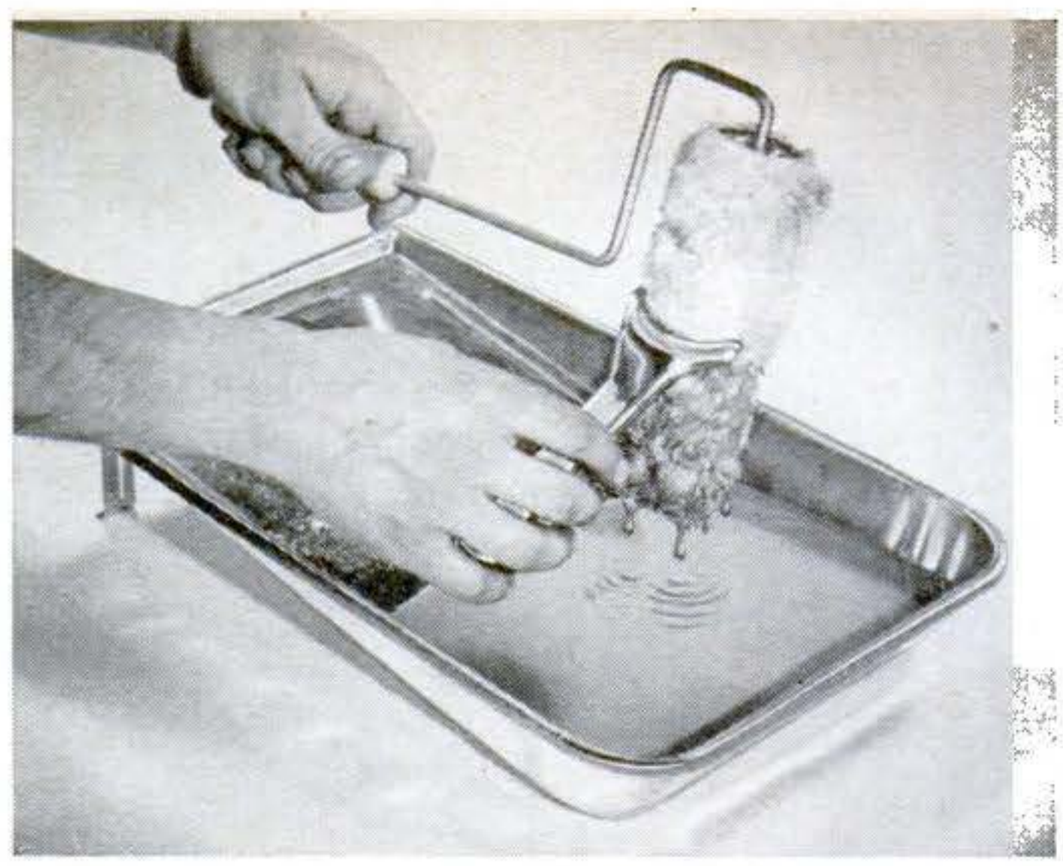
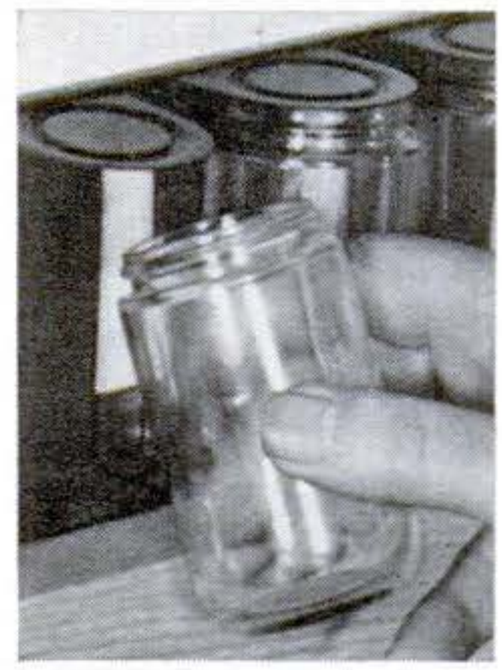
New Tools

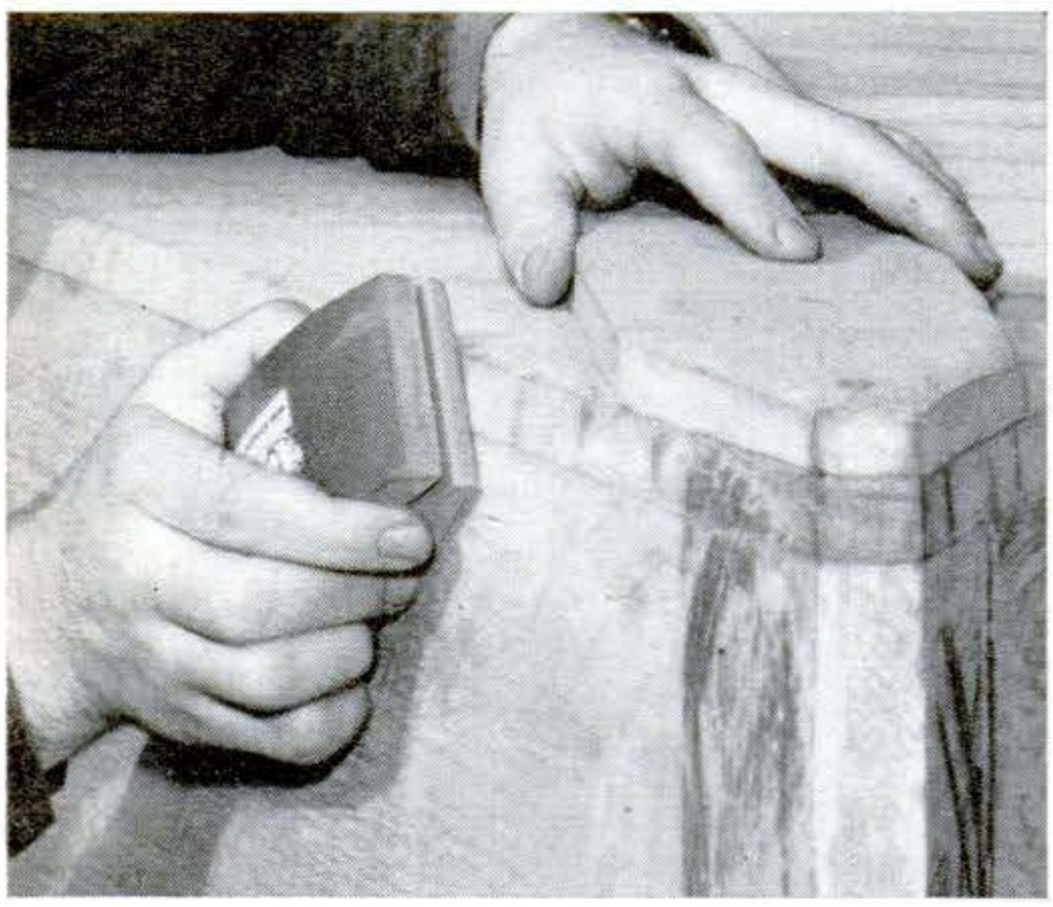
1 Tool Closes Flooring Joints. Drive the toothed end of this tool into the subflooring as above, and it serves as a lever to close a joint in tongue-and-groove flooring. A hinged and pointed arm, trailing after, holds the pressure applied while the loose board is being nailed.



2 Removes Paint from Roller. To aid in cleaning a paint roller, the little scraper above takes off excess paint. Its slightly offset rolled edge will not cut the wool cover of the roller, and keeps the paint from splashing.

3 Parts Rack. Jars for nails, screws and other small parts simply snap in and out of the metal clips on this rack. There are no screw caps to remove. The racks come in two sizes for five- or eight-ounce baby-food jars.





4 Sanding Block Is Rubber. Sheets of 2¾″ by 9″ paper can be inserted individually or in stacks in the all-rubber block above. The block is solvent-resistant so that it can be used for wet sanding. It is designed to fit the hand and is suitable for fine or heavy sanding.

5 Drill Press Has Tilting Table. The sanding table of a new drill stand tilts to 45° and adjusts up or down. The stand, made for a ¼″ drill, frees both of the user's hands for sanding, buffing, grinding or wire brushing. Another model includes only stand and clamp.

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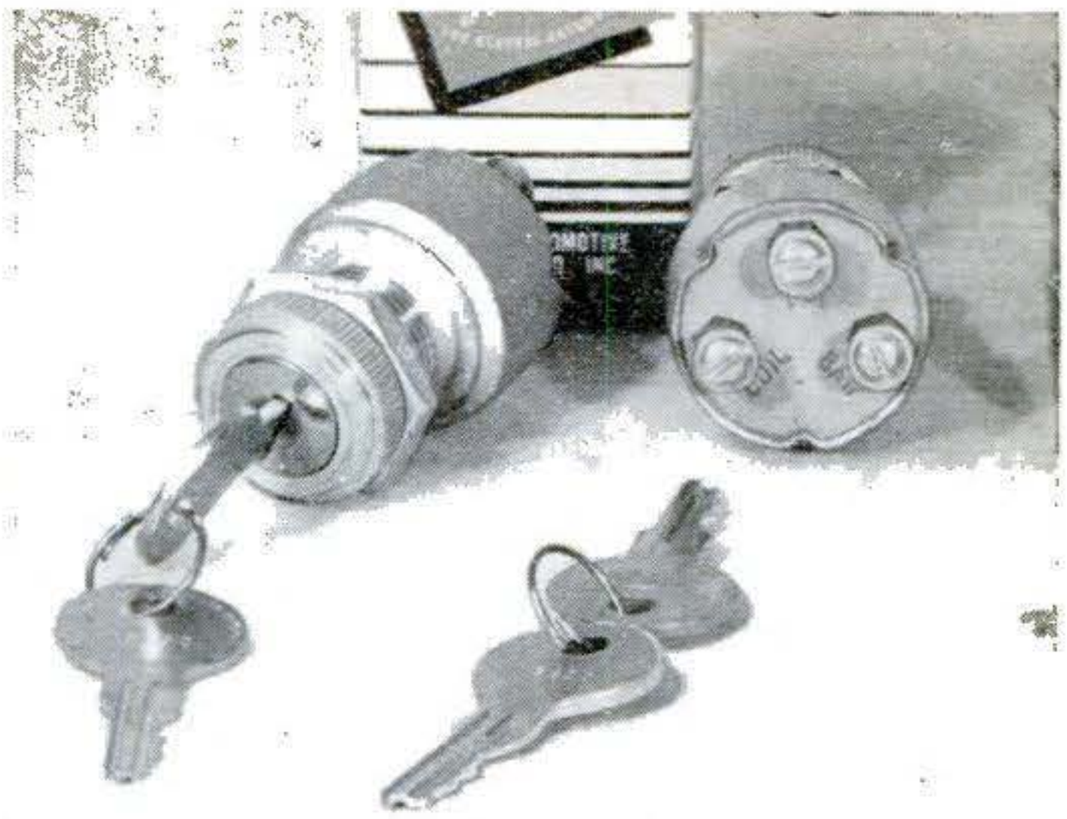
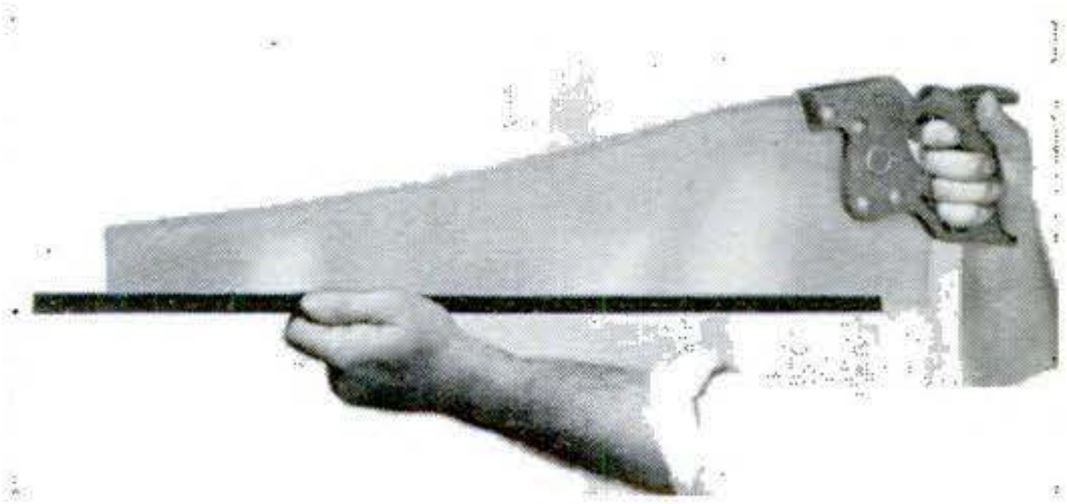
6 Finishing Sander. The platen of this sander oscillates 4,250 times a minute. Diameter of the orbit is 3/16″, permitting the tool to be used in any direction on wood without showing swirl marks. The sanding surface—3⅝″ by 9″—extends beyond the body, making sanding in close quarters easier. For convenient operation, the knob handle can be placed on either side or at the front of the machine.



7 Switch Locks Power Tools. With one of these switches on a power tool, no one can use the tool unless he has the key. The danger of children fooling with a tool is removed. When the key is turned left, it lights the lamp; turned right, both lamp and motor operate. Removal of the key locks both lamp and motor. The switch can be used on other equipment such as boats, farm equipment, washing machines.

8 Protects Saw's Cutting Edge. When a saw is not in use, a snug-fitting protector of vinyl plastic will keep its teeth rustfree and sharp. Easy to slip off and replace, it comes in lengths to fit saws of popular standard sizes. The inexpensive guard is said to be unharmed by oil, gasoline or sunlight.



9 Sharpens Hollow Chisels. This sharpener is chucked in a brace and the mortising chisel to be sharpened is locked in a vise. A few turns of the brace and the high-speed-steel sharpener puts a keen edge on the chisel. A file is used to remove burrs and finish the corners.

10 Circular-Saw Sharpener. Calibrations on the guide arm and file holder make it easy to sharpen circular blades with a new tool. The correct angle and rake are set by adjusting the guides. The tool clamps to a workbench. A triangular file and four mandrels are included.

Further information on these tools may be obtained from: 1. Consolidated Products, Winsted, Conn.; 2. Brush Save, Inc., 5049 W. Loomis Rd., Milwaukee 15; 3. Ful-Vu, Box 3513, Merchandise Mart, Chicago 54; 4. Behr-Manning Corp., Troy, N. Y.; 5. Arrow Metal Products Co., 140 W. Broadway, NYC 13; 6. The Black & Decker Mfg. Co., Towson 4, Md.; 7. Irving S. Miller, 3012 Wallace Ave., NYC 67; 8. The Dyer Products Co., 2nd St. S. W., Canton 2, Ohio; 9. Woodworkers' Tool Works, 222 S. Jefferson St., Chicago 6; 10. Speed Corp., 512 N. E. 73rd Ave., Portland, Ore.

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WHAT'S WRONG ?

Check Your Soldering Know-How

SOFT solder has a thousand uses, but sometimes a job is unusually difficult to do or disappointing when finished. Failure to clean the metal thoroughly, removing dirt and oxide film, is the most common mistake and can result in a botched joint. The drawings above show nine other errors, and if you can spot them all, you're probably a first-class soldering mechanic yourself.

ANSWERS

1. The finished joint will fall apart as heat is conducted to it from the second one. Either clamp the first or wrap it with a wet rag.

2. Held with pliers, the work may move during cooling, crystallizing the solder and making a weak joint. Clamp or wire the parts together.

3. The tip should be filed the full length of the bevel. As shown, it can be tinned only at the point and will be useless except for very small work.

4. A loosely twisted joint like this depends upon the solder for strength. A good splice is so tightly twisted that it will be strong without solder.

5. Acid flux should not be used for doing electrical work, as it corrodes joints unless it is washed off. Rosin is the right flux for such jobs.

6. Fillets make only a tack joint. For maximum strength, tin both surfaces first (coat with a thin film of solder). Then sweat them together by heating while the tinned surfaces are held together.

7. The soldering iron shown is hopelessly small for the job. Heat will be conducted so rapidly that there will not be enough to melt the solder freely and bond it to the metal.

8. A mere bead of solder will give way. But a split sleeve, tinned inside and sweat-soldered across the break, will probably make the lamp standard as strong as new.

9. Solder will not hold on such stressed joints. The spindle will break again at the first turn. A new one is the answer.

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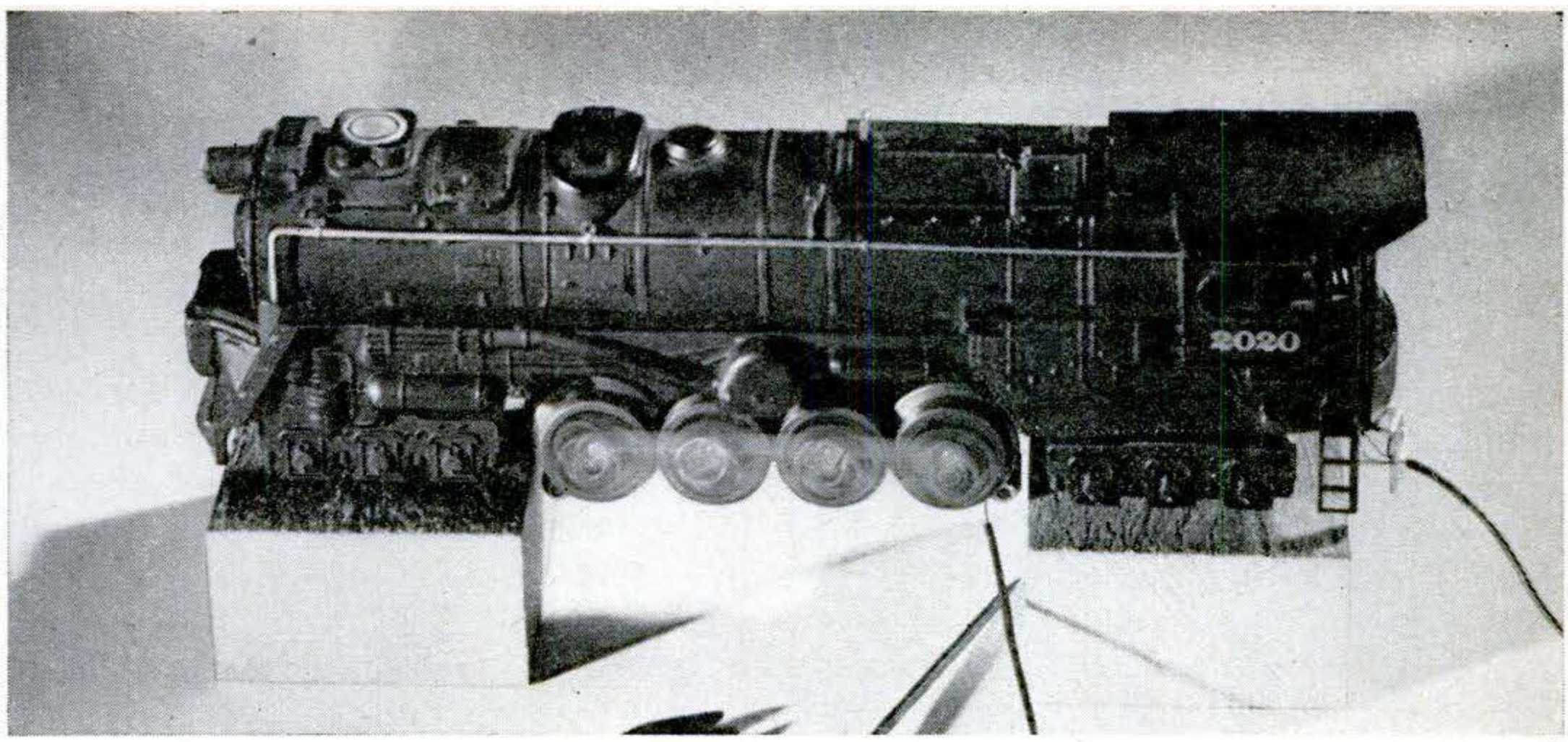
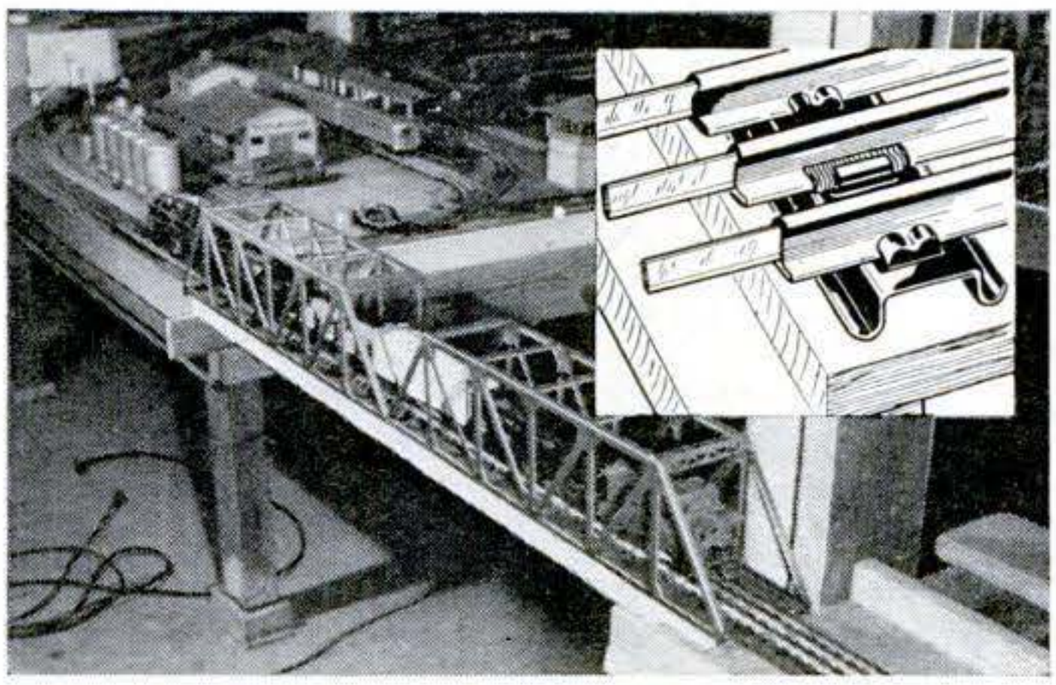


4 Hints for Model Railroaders

Opening Up Clogged Smoke Unit. Running light, a locomotive's smoke unit often does not get hot enough to keep the smoke chemical fluid. This causes it to crystallize around the tiny vent hole over the puffing piston, eventually clogging it.

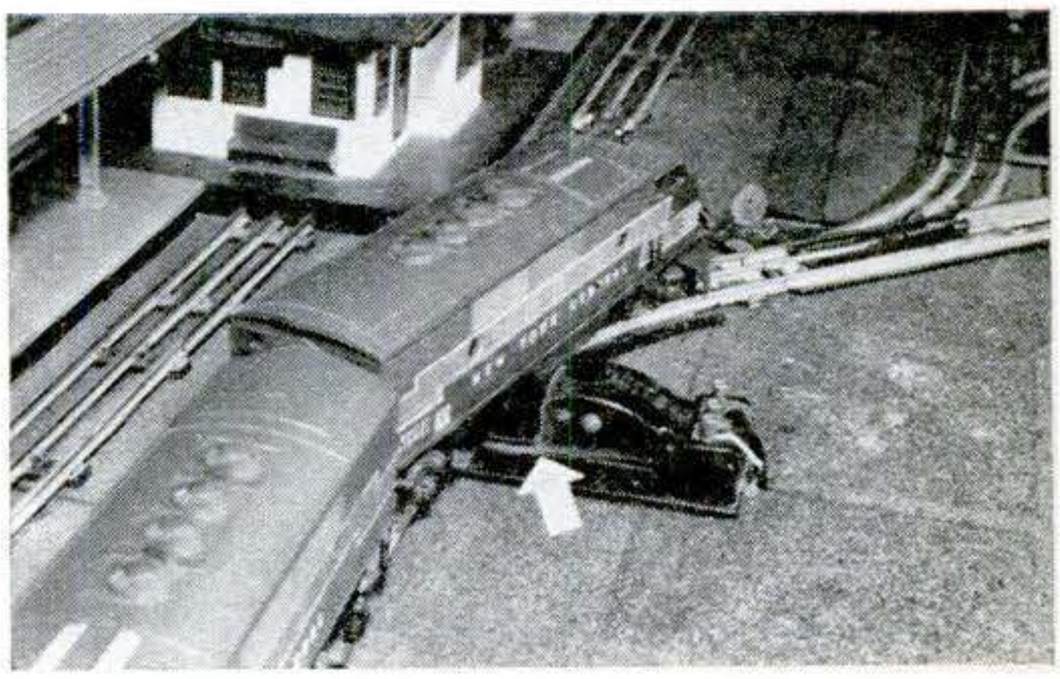
The remedy is to apply full voltage to the loco while it stands in the neutral position to "cook" the smoke material into a completely fluid state. Then flip the lever and run the loco at high speed to blow out the vent hole. The bench setup (above) is a good way of doing the job. Hook up one transformer wire to the current collector, the other to the frame.



Lift-Out Bridge Clears Busy Path. The route to the washing machine must never be obstructed—not even by a railroad. A pair of truss bridges screwed end to end on a straight piece of shelving board make one long bridge that can be quickly lifted out of the way when the evening's operation is over. Strips of thin brass or pieces broken from a razor blade are forced into the track sections adjacent to the bridge and soldered in place. The bridge track is forced down on these projecting strips to complete the circuit. This eliminates forcing whole sections of track back to insert track pins. A small wood block screwed to the table ends will support the bridge.

Candy-Box Separators Make Roofing. Embossed-cardboard separators found between layers of chocolates make ideal roofs for water towers, sheds and stations. They are usually dark brown and need no paint.

Streamliners Use 027 Switches. You can use 027 tinplate switches in an O-gauge layout if you cut away part of the plastic solenoid housing to clear the overhang of longer cars. The opening that is left after cutting away the housing can be covered with small pieces of thin black fiber. Altered in this way, the switches will accommodate O-gauge Diesels and long streamlined scale-type passenger cars.



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[*Continued from page 150*]

hours on the factory ships, averaging only four hours' sleep a day for a season which lasts two months or more.

The quarters on the catcher boats are unbelievably cramped. The men can't wash, don't undress, and it is so cold that the brain works slower in getting the simplest kind of messages through to the hands.

The factory ship carries a doctor because there are many injuries on one of these expeditions—cuts, broken legs, etc. But there are no colds and there is very little sickness until a supply ship comes down from Europe. The air is free of bacteria until then—when an epidemic of colds is spread by the supply ship's crew.

Radio Keeps Ships in Touch

Although there are many ships in the armada, they spread out and see nothing of each other for days at a time. They keep in touch by radio. All are equipped, too, with radar as a safeguard against icebergs.

When a whale is killed, pulled alongside the catcher boat, blown up with air to keep it afloat, and flagged with the company flag, the catcher boat rings up the factory ship to report its exact position. A buoy boat, which may be 50 miles away, is then sent to tow the whale to the factory ship.

The factory ship has a big square hole in the stern with a sloping slipway—like a tank landing craft. A pair of huge iron tongs drop over and grip the whale's tail. Then a winch pulls it up the slipway to the flensing (cutting) deck. The blubber is cut off and dropped through huge holes in the deck to the cookers.

Men Must Learn to Stand Stench

The whale is next pulled forward to another deck, where the meat is cut off and sent to the freezer ship. Then the liver, which may weigh much more than a ton and is very rich in vitamin A, comes out.

The stench of dead whale is so strong that a factory ship can be picked out in a fog from three miles away. The odor is even worse when one of the dead whales, used as a fender between it and a 20,000 ton fuel-supply ship, blows up with its own gas and bursts.

But the men get used to all this, and they are paid by a bonus system. Not only the gunners and their picked crews but everyone, including the doctor and the firemen, can double his pay if the catch is good. The lowest-grade laborer on an expedition can earn up to $1,400 in six months—probably twice what he would earn in England or Norway.

Hunting Season Is Limited Now

Whaling has always been profitable. But the old-time whalers, in the days when there was no control, overdid it. They fished out the arctic. Now, to make sure that the same fate does not befall the antarctic, the season and the catch is controlled by the International Whaling Commission.

Each factory ship carries an inspector to make sure the fleet does not break international regulations. Sandefjord, in Norway, is the control point. It receives a radio report on the day's catch from each whaling fleet. When the season's allotted catch has been about reached, Sandefjord radios the season's closing date.

This year the whaling season is expected to last only 75 days. Then the ships will steam north. In the future they may leave the bleak immensity of the antarctic even sooner, thanks to the adoption of electric harpoons. END

Gone for Lunch

THE boys at the roundhouse observed that one of the crew was unusually glum, and asked what was bothering him.

"I think my wife is tired of me," he replied.

"What makes you think so?" inquired a marital-wise friend.

"Every day this week," he answered, "she has wrapped my lunch in a road map."—*Fireman's Fund Record*

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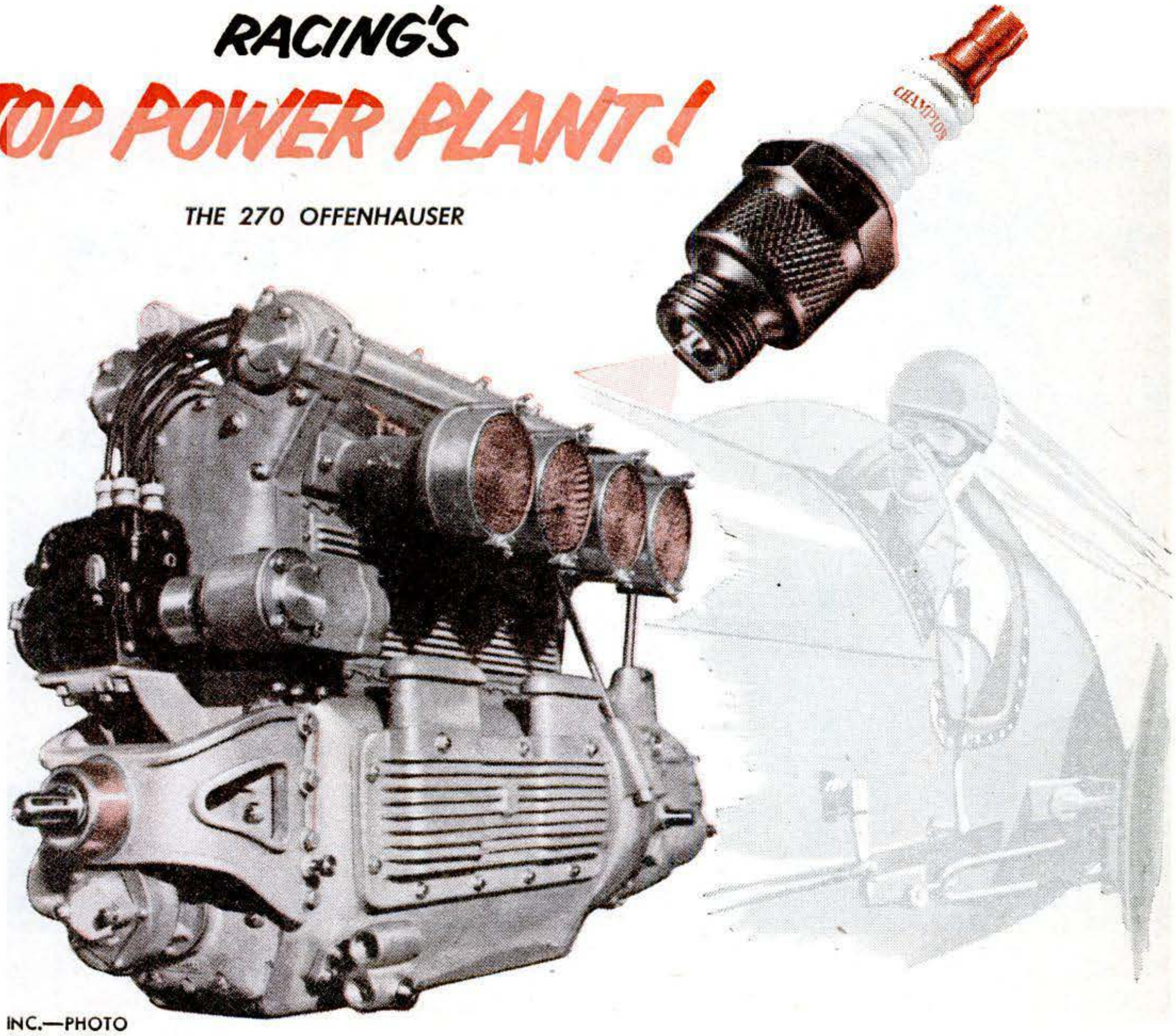
RACING'S TOP POWER PLANT!

THE 270 OFFENHAUSER



TREND, INC.—PHOTO

"I build racing's top engine. Here's why I recommend Champion spark plugs for your car." Louis Meyer

Louis Meyer, three-time winner of the Indianapolis 500, three-time national AAA racing champion, today builds America's foremost racing engine—the Offenhauser, product of the Meyer-Drake Engineering Company. Its success in competition is without parallel in automobile racing.

Says Meyer, "We specify Champion Spark Plugs as standard equipment for the Offenhauser because we've never found any spark plug that can equal Champion in that extra notch of power and speed and extra dependability which you must have for championship performance. Speaking from broad experience in this field, we know that all Champion Spark Plugs are built to *one, single* exacting standard—the best that top research, engineering and manufacturing can produce.

"Therefore, I say to every motorist, 'If you value the very best performance of which your car is capable, you'd better specify Champions for your car. In my book they're tops for every engine, and the record books prove it'."

CHAMPION SPARK PLUG COMPANY, TOLEDO 1, OHIO

FOLLOW THE EXPERTS — Demand **CHAMPIONS** — FOR YOUR CAR!

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Adventure in Color Pictures

The world of miniature color photography is exciting . . . rewarding. Here you can pick a "team of two" to help you discover it.

THERE'S nothing more satisfying than "shooting it in color" on Kodachrome Film, then staging grand color shows. On these pages you see expert Kodak miniature cameras for taking color shots . . . projectors and viewers for showing big images of the beautiful color slides you get. Let your Kodak dealer help you select a camera-and-projector "team" to fit your budget. Ask, too, about full-color prints and enlargements from your slides.

• • •

Latest in home projection is the brilliant new Kodaslide Highlux III Projector, shown above. Its 300-watt lamp, combined with a specially designed optical system including Kodak Projection Ektanon Lens, 5-inch *f*/3.5, gives top brilliance plus unsurpassed color purity and over-all definition. Three-way slide cooling—by baffles, a fan, and heat-absorbing glass. $56.50 (including carry case with built-in fan).

New economy 35mm. camera — The new Kodak Retinette Camera is a miniature beauty. Slips into small coat pocket. Fine three-element *f*/4.5 lens assures sparkling color slides. Has automatic film stop, counter, double-exposure prevention. 8 speeds to 1/300 . . . and a delayed-action setting. Built-in flash "synch." Only $59.50.

New model of famous Retina Camera—The new Kodak Retina IIa Camera with Schneider Retina-Xenon *f*/2 Lens and Synchro-Compur Shutter, 1 second to 1/500, is designed for action work in color. Single window for range finder and view finder; rapid lever-action film wind; automatic film stop; double-exposure prevention. $164.10.

Moderate-price range-finder "miniature"—The new Kodak Signet 35 Camera features Kodak's finest lens—Ektar *f*/3.5—for extra color brilliance. Speeds to 1/300. Built-in range finder, flash "synch." Exclusive ball-bearing action for ultra-smooth focusing; automatic exposure counter; film stop; double-exposure prevention. $92.50.

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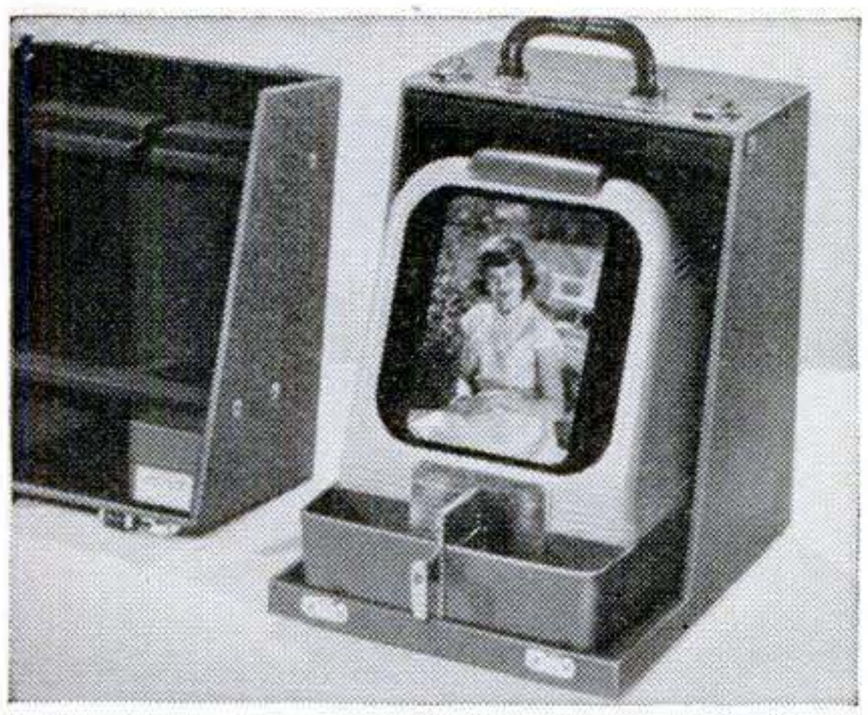
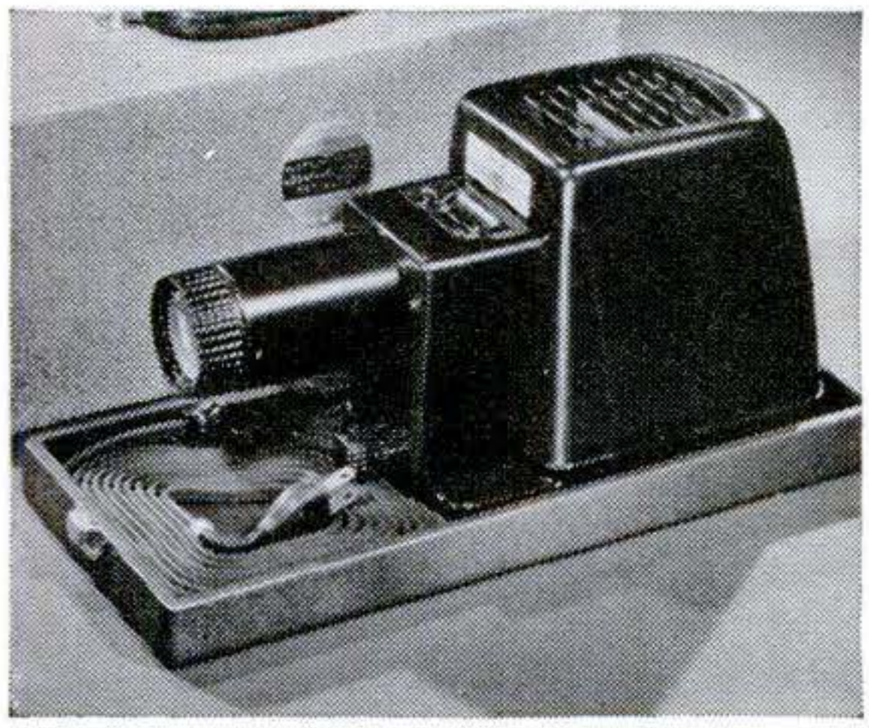
Kodak Pony 828 Camera (left)—Inexpensive color camera with color-corrected Kodak Anaston *f*/4.5 Lens; Kodak Flash 200 Shutter. Takes 8-exposure black-and-white, Kodachrome, and Kodacolor Film. Only $31.15.

Kodak Pony 135 Camera (right)—Makes superb color slides on Kodachrome Film. Has automatic film stop and exposure counter. Uses all Kodak 135 Films, 20 or 36 exposures. A good buy at $35.75.



Kodaslide Table Viewer, Model A (left)—Projector, screen, and slide changer in a single unit. Projects brilliant images in lighted room. Takes 75 cardboard or 30 glass slides. Images appear as push-pull plunger positions slides. $97.50.

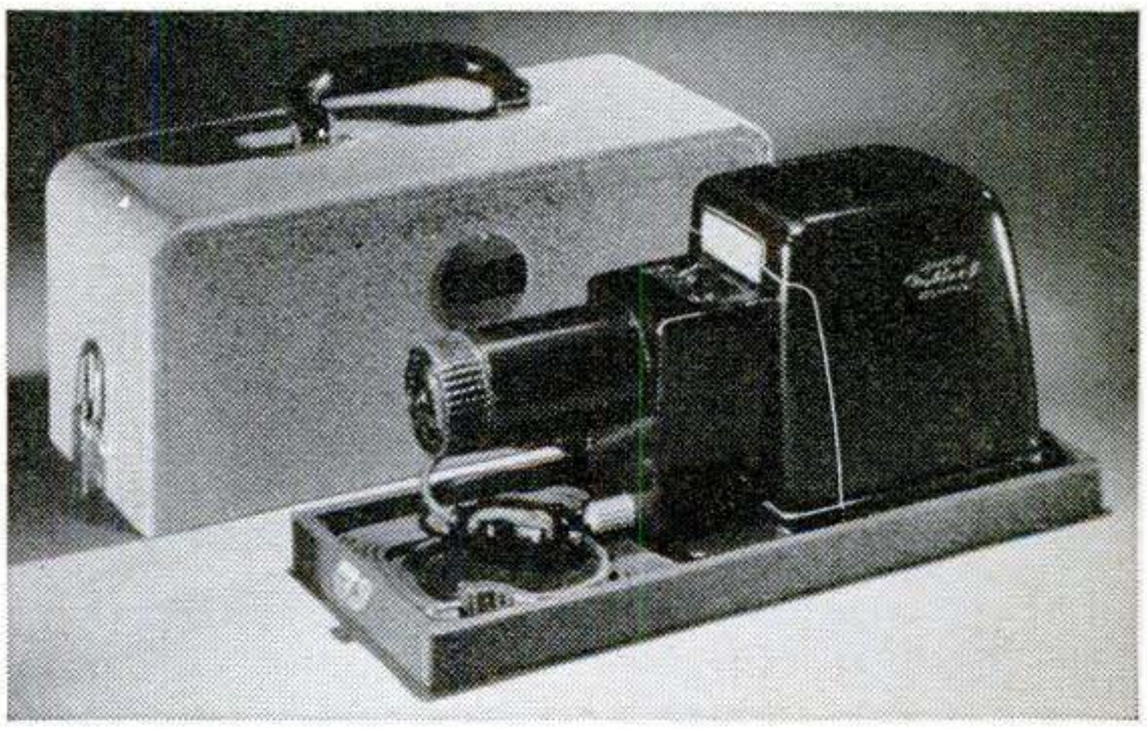
Kodaslide Table Viewer, 4X (right)—This budget-priced viewer enlarges slides four times on its built-in screen. Showings are effortless. $49.50.



Kodaslide Merit Projector (left)—Features improved slide-feeding mechanism on top of projector, eliminating danger of jarring instrument. Includes Kodak Projection Ektanon Lens, 5-inch *f*/3.5. $26.10.

Kodaslide Projector, Master Model (right)—Fast lenses, 1000-watt lamp can deliver more light to screen than any other 2 x 2-inch slide projector. Choice of 4 lenses. From $169.00.

New Kodaslide Highlux II Projector (right)—This highly capable 200-watt projector is a companion product to the Highlux III. Features include Kodak Projection Ektanon Lens, 5-inch *f*/3.5; heat-absorbing glass for slide protection; two Lumenized condensers for uniform light distribution over the picture area. If, later, you wish to convert to 300-watt screenings, you can do so very easily. Simply purchase the Kodaslide Highlux Blower Case for $19.20 and insert a 300-watt lamp (extra). Price of the Highlux II, $36.50.



You can see this equipment, and many other interesting items, at your Kodak dealer's. Stop in any time and ask for a demonstration. His professional knowledge and experience will prove valuable in helping you make a selection that will best suit your needs.

Eastman Kodak Company, Rochester 4, N. Y.

Prices subject to change without notice and include Federal Tax where applicable.

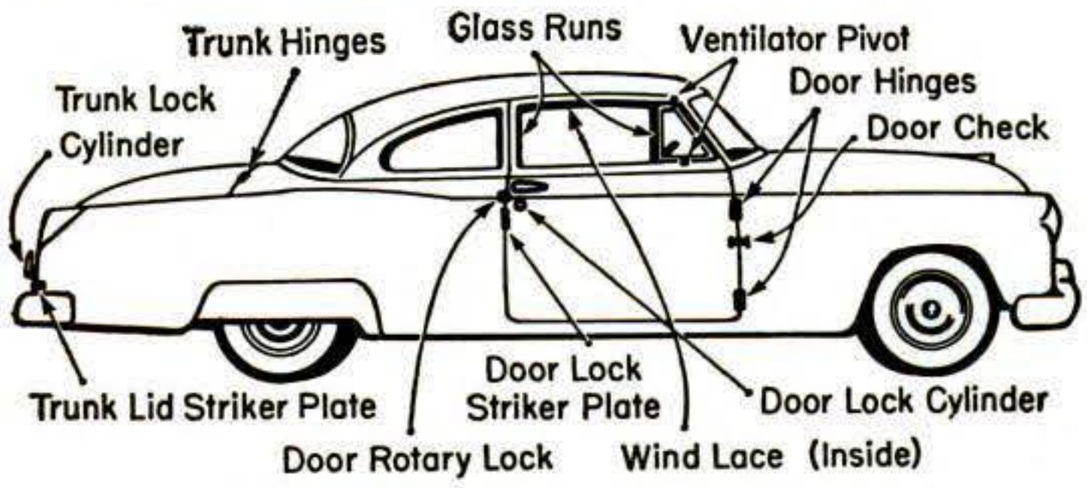
Kodak
TRADE-MARK

Care and Feeding of Engines

BY S. P. CORP

BODIES NEED LUBRICATION, TOO

Body lubrication is necessary if you want a quiet car, because body noises are caused by dry surfaces rubbing together. To do a good job, you will require a can of light engine oil, a stick of lubricant or a grease pencil, and a tube of powdered graphite, all obtainable at any gas station or car dealer.



QUICK GUIDE TO BODY LUBRICATION

1. Refer to the diagram and apply a thin coating of graphite to all glass-run channels, working glass up and down until graphite is worked in. Insert end of graphite tube into key opening of door locks, squeezing tube to force graphite into working parts; also the trunk lock.

2. Use grease pencil to apply a thin coating on door lock striker plate and trunk lid striker plate. Open doors and apply grease pencil to each weather cord, the cloth covered tube around each opening, wherever it contacts the door. Friction between weather cord and door often causes door squeaks.

OIL HINGES AND FRONT SEAT TRACKS

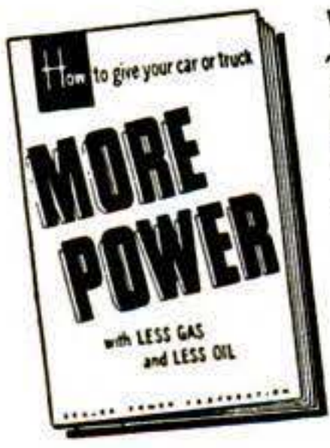
3. Apply light oil to all door and trunk hinges, door checks, door rotary lock, and pivots on door and window ventilators.

4. Front seats are usually on tracks. A few drops of oil here will make seat move with less effort and more quietly.

5. When windows are hard to operate, remove door or window trim pad and apply grease to window regulators, using your grease pencil.

6. Part of your body lubrication job should be a careful check to see that drain holes in the bottom of each door are open, so that rain running down the windows can find its way out. Clogged drain holes can cause doors to rust out from the inside.

By following these simple instructions, you can keep the body of your car as quiet as when it was new.



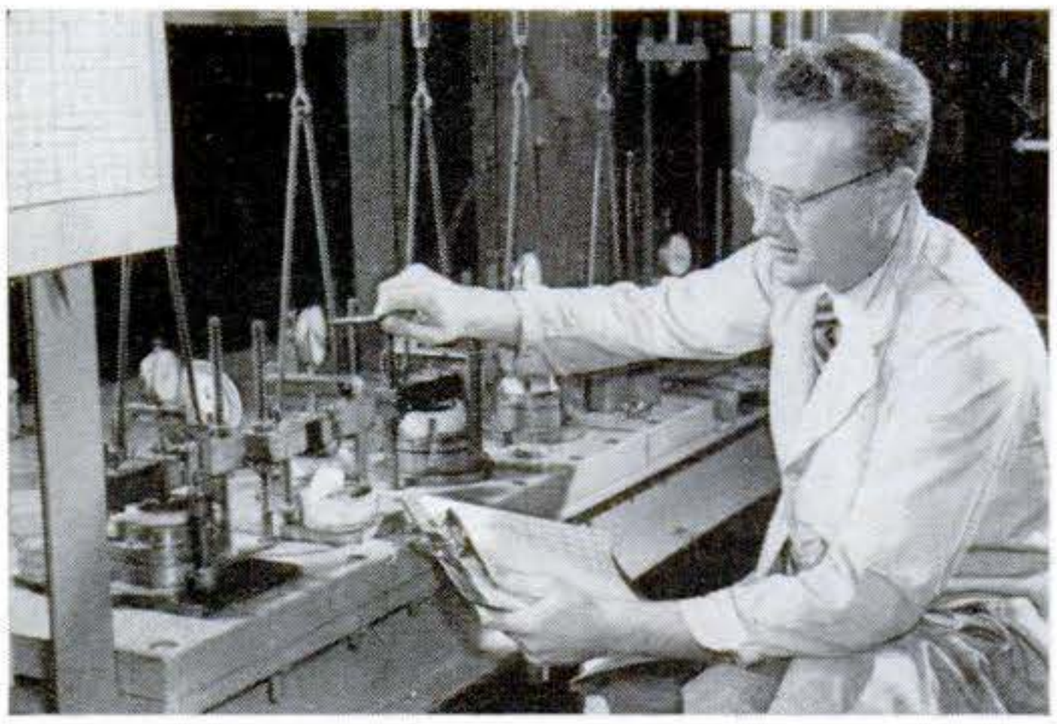
WRITE FOR FREE BOOKLET

This new booklet, "MORE POWER, Less Gas, Less Oil," tells many facts about car care, and about new Sealed Power KromeX Ring Sets, engineered to fight heat, friction, abrasion, and corrosion in late-model cars and trucks. A postal card to Sealed Power, Dept. H-1, Muskegon, Mich., will bring your free copy. It can save you real money.

Industry Clamors for Trained Men

[Continued from page 141]

were GIs with only middling high-school records who did fine work in college after the war. One submarine sailor finished high-school studies by mail between watches at sea, took college-entrance exams when he got out, and went through college with honor grades.



CIVIL ENGINEER. John H. Schmertmann, 23-year-old soil-engineering specialist, paid for almost all his professional education by part-time and summer jobs, loans and scholarships. In four years at MIT he received $1,200 in scholarships—$200 from the Scarsdale (N.Y.) Lions Club, the balance from Tech itself. He borrowed $300 more from the Lions and $1,800 from MIT, which he is now repaying at $100 a year. Summer work—gardening and surveying—brought in $1,850. Work in the Tech library and soil lab—seven to 10 hours a week for four years—paid him $600 more. Another $700 he had saved by working during high school. A $125-a-month research assistantship paid for a year of graduate study at Northwestern—and let him run a car. Schmertmann, shown above using a consolidometer to test soil samples from a factory site, is now with Moran, Proctor, Mueser and Rutledge, New York consulting foundation engineers.

For some, a hitch in the service means a chance to pick up new skills. Alphonse Peter, doing advanced work on jet propulsion at Caltech this year, was an electronics technician in the Navy. He told me that he felt that two years of travel and living away from home gave him an edge on his University of Connecticut

[Continued on page 250]

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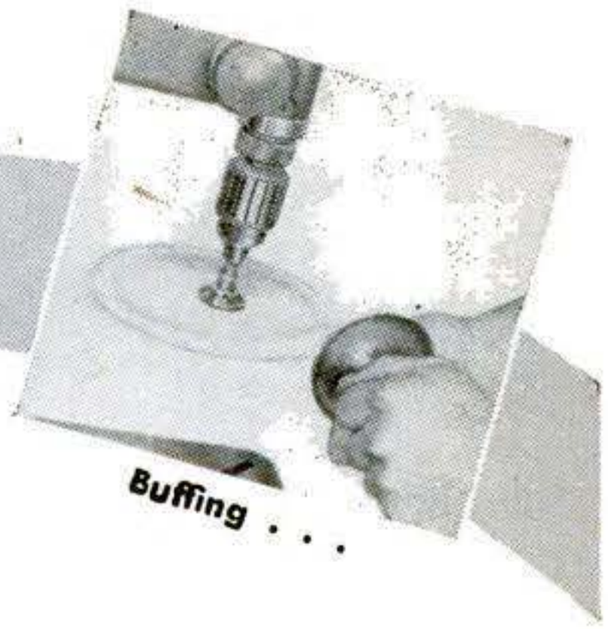
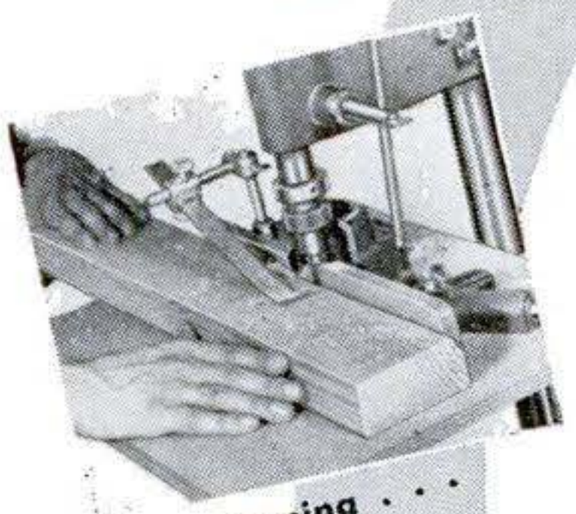
MOST USEFUL TOOL FOR YOUR SHOP

Cleaning . . .



Buffing . . .

mortising . . .



shaping . . .

sanding . . .

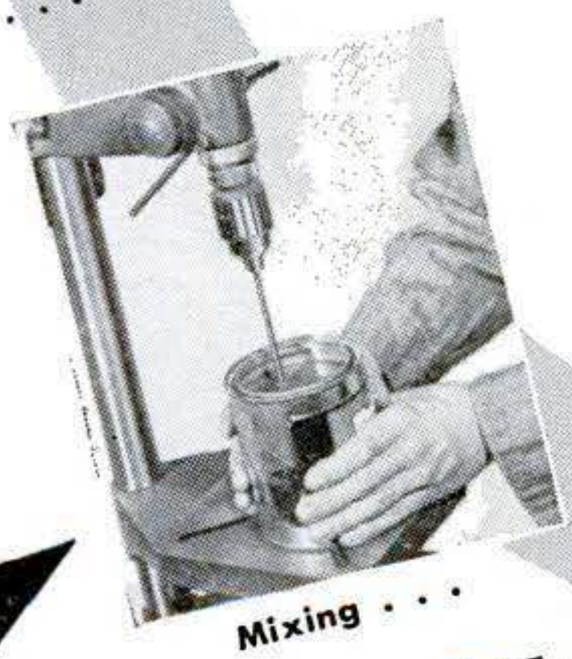
Atlas

15″ DRILL PRESS

You get yourself a whole "shop-ful" of tools when you install an Atlas 15″ drill and accessories. The photos just begin to show its usefulness and hint at the money you can save—while having fun—fixing and making things for your home.

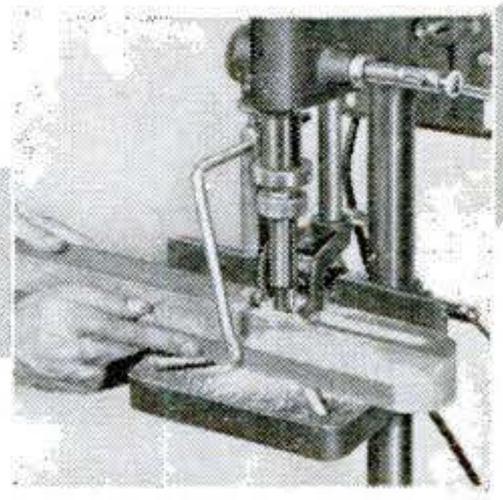
And the Atlas is built to last you a lifetime—with exclusive "floating-drive," six-splined spindle, steel drive sleeve, 4 sealed-for-life ball bearings, new exclusive depth control stop, extra-heavy head, table, column, and base for accurate work.

It gives you 41″ work capacity over the precision-ground table, 46″ over base. You'll probably want the high speed model with 4 speeds, from 580 to 5200 RPM, for work on woods and plastics as well as metals. Send the coupon or a postcard today for latest catalog.



Mixing . . .

Polishing . . .



and carving.

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20 PRACTICAL PLANS

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than any other power tool in America!

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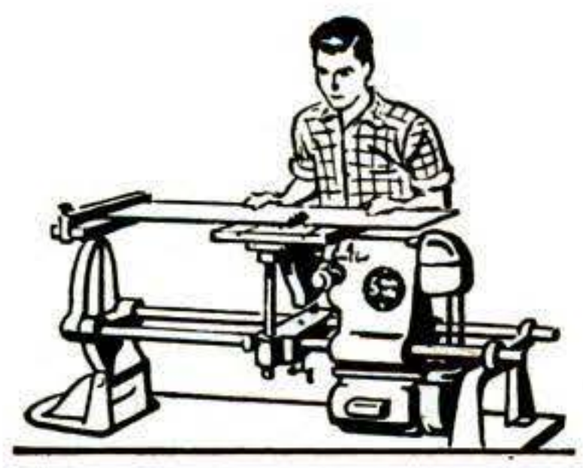
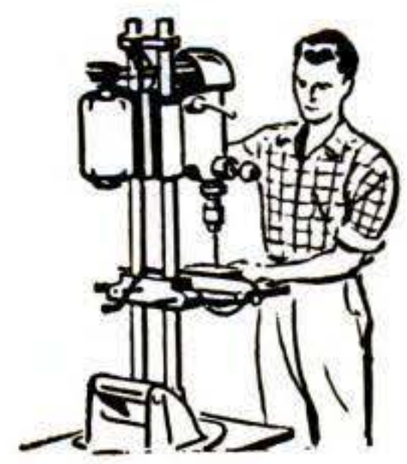
A COMPLETE Workshop!

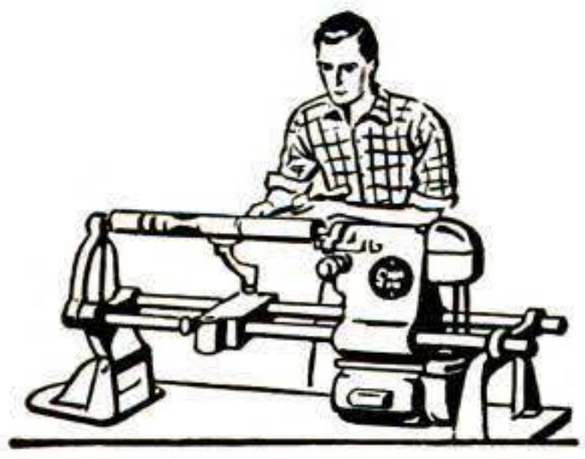
Five superior tools in the space of one!



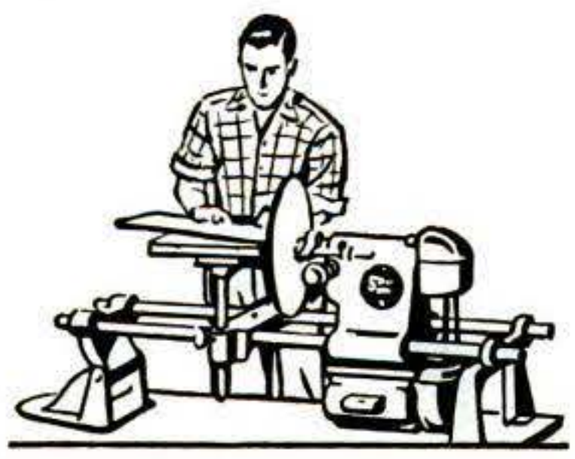
CIRCULAR SAW cross-cuts, rips, bevels or miters. Maximum depth of cut, 2¼″. Depth regulated by built-in micro table-raising mechanism. Up to 48″ between blade and fence!



DRILL PRESS drills, routs, reams, mortises, countersinks wood, metal, plastic. Up to 27″ between table and chuck. Saw fence miter gauge and tilting table provide automatic settings without special jigs.



LATHE turns wood, plastics. Extra capacity—15″ swing, 33″ between centers. Tool rest slides parallel to work; is quickly adjusted, locked into position for any operation, including faceplate turning.



DISC SANDER is a precision tool you'll use often. No "chatter" when beveling thin pieces. Plain and compound miter sanding. 12″ sanding disc is dynamically balanced . . . installed instantly.

HORIZONTAL DRILL PRESS is ideal for pieces too big or awkward for vertical drill press. Length of work limited only by size of room. It's the *only* professional doweling tool available for the home workshop.

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Complete 5-tool unit

only $189.50

Motor* and bench extra

* Special SHOPSMITH motor; heavy-duty, ½-hp., ball-bearing, capacitor, 110 V, 60 cycles—**$34.50.**

SHOPSMITH is America's largest selling power tool because it's a real *multi-purpose* tool that actually outperforms most saws, sanders, drills and lathes.

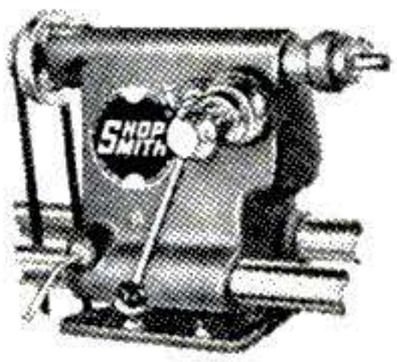
It offers hairline accuracy, tremendous capacity, important savings in money and space, and many quality features formerly found only in the most expensive professional tools. SHOPSMITH versatility means you have the proper tool, simplified adjustments and ready-made jigs for difficult or unusual operations, and to change from one tool to another takes less than 60 seconds.

SHOPSMITH is *not* a makeshift one-bench assortment of individual tools never designed to work together. It was designed from the beginning as a multi-purpose tool, and is time-tested, rugged, practical and completely flexible. Yet its cost fits the most modest budgets. Fill out and mail the coupon today for SHOPSMITH's colorful 16-page booklet. It's free!

SHOP SMITH®

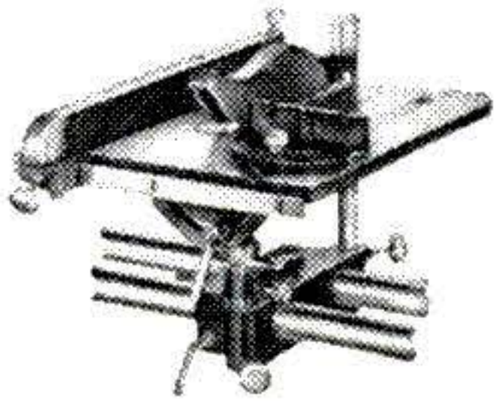
Compare SHOPSMITH quality with any other power tool!

BALL-BEARING CONSTRUCTION. Spindle floats on *four* grease-sealed ball bearings. Spindle tip is induction-hardened, has reverse-tapered safety flat.



MACHINE-TOOL PRECISION. All moving parts are machined to precision tolerances. Headstock and carriage slide effortlessly on the ways.

HEAVY-DUTY CASTINGS. No stamped metal parts. Castings are fine-grain grey iron or rigidly ribbed, top-grade aluminum alloy.



EXCEPTIONAL QUALITY THROUGHOUT. Because they are used for all major operations, parts are made with special care from top-grade materials.

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Gives complete details. 16 illustrated pages. Send coupon for your free copy.

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Please send me my free copy of the SHOPSMITH catalog and the name of my nearest dealer.

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Industry Clamors for Trained Men

[*Continued from page 246*]

classmates: he knew what he wanted in college and his experience in electronics helped. He advises service before college. "A two-year hitch is about right."

Of course West Point and Annapolis provide a free engineering education, and take both enlisted men and boys straight from high school. The smaller Coast Guard Academy offers an excellent course in "general engineering." Its cadets are selected strictly by competition.

Join the Navy and Get an Education

The Navy offers another opportunity—the Holloway Plan, open to both Navy enlisted men and to boys graduating from high school. If selected, you can choose any college that has a naval ROTC unit. The Navy pays your tuition and fees for the four-year course, plus an allowance of $50 a month. This will just about cover board and room in most places. In return, you take certain courses required by the Navy and spend your summers on training cruises. You also agree to serve three years on active duty after college, plus eight in the reserve.

The colleges save jobs for students who need the money. They also hold down a man's work week so that his studies won't suffer and he has a little time for fun. MIT and Caltech, for instance, advise students to limit outside work to 10 or 12 hours a week. Carnegie Tech puts the outside limit at 15 hours. This means that a student can make about $300 or $400 during a college year. But at other places students work as much as 30 hours a week—and still keep up their studies. This doesn't leave much time for football, beer and dates.

Full-time summer work can be an important part of a man's education—and bring in $300 or $400 more besides. An engineering student can pick a plant in

[*Continued on page 252*]

UNCLE WALTER

IT SMELLS GRAND

AROMA PROMISING SWEET RELEASE

IT PACKS RIGHT

CUT TO PACK
SO JOYS INCREASE

IT SMOKES SWEET

MAKES EVERY PIPE
A PIPE OF PEACE!

IT CAN'T BITE!

SIR WALTER RALEIGH'S BLEND OF CHOICE KENTUCKY BURLEYS IS EXTRA-AGED TO GUARD AGAINST TONGUE BITE. STAYS LIT TO THE LAST PUFF. AND NEVER LEAVES A SOGGY HEEL IN YOUR PIPE.

It costs no more to get the best!

• SHOP by MAIL & PAY LESS at GROBAN'S •

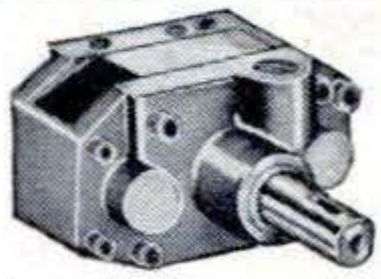
ITEM #350

LOGAN AIR CYLINDER Item #350 — Double acting pneumatic cylinder, 6" bore, 6" stroke, 1½" shaft. Adjustable cushions at both ends. Flange mounting at shaft end. Overall length closed 18". Ideal for use in 125 PSI systems. Shipping weight 40 lbs. F.O.B. Chicago.... **39.50**

HEAVY DUTY HYDRAULIC and AIR EQUIPMENT

Large supply of new labor-saving, economical hydraulic equipment in many types and sizes. Use these positive, highly efficient smooth pressure hydraulics on presses, arbors, lifts, loaders, power control, positioning, brakes, plastic dies, auto frame alignment, etc.

ALL ITEMS UNCONDITIONALLY GUARANTEED



Item #29KJ — Gear Type Hydraulic Pump. Ideal in industrial applications and for operating all hydraulically powered farm implements including loaders, stackers, swathers, plows, etc. Delivers 1000 PSI (may be set at lower PSI if desired). 12 GPM at 400 RPM. Maximum operating speed 800 RPM—rotation counter clockwise. Has built-in relief valve, permanent or torque bar mounting. 1" diameter shaft, ¾" pipe tap inlet, ½" pipe tap outlet. Ship. wt. 22 lbs. F.O.B. Chicago **45.50**

ITEM #1036

ITEM #42—Double action hydraulic cylinder, 4" bore, 18" stroke. Rated lift capacity with 1000 PSI line pressure is 12,500 lbs. Ship wt. 30 lbs. F.O.B. Chicago. An Excellent Buy for..... **32.50**

Item #16C—Double acting hydraulic cylinder, 1½" bore, 26" stroke. Will lift 1760 lbs. with 1000 PSI line pressure. Weight 8 lbs. A $55.00 value. Now only..... **16.95**

Item #1036—Double acting hydraulic, 3" bore, 36" stroke, ½" pipe thread ports, 1¼" solid steel shaft. Overall length closed 49", clevis mounting at base and shaft. FEATURES • Cup & Chevron Packing • All Welded Construction • Precision Ground and Honed Construction • ¼" Seamless Steel Tubing Cylinder Case. Weight (net) 57½ lbs. F.O.B. Chicago **50.00**

PUMP PRESSURE (PSI)	LIFT CAPACITY (LBS.)
500	3535
1000	7069
1500	10604
2000	14138

Item #126—Four-way, open center control valve with built in adjustable relief valve. Factory set at 1000 P.S.I., spring loaded neutral position, for use with one double acting cylinder. In neutral position cylinder is locked and pump unloaded. Fully balanced plunger type, smooth, positive easy operation, can be used as single unit or mounted in series of any combinations desired. Has ¾" pipe thread inlet and outlet, ½" pipe thread cylinder ports. Newly manufactured to our specifications. Shipping weight 8¼ lbs. An outstanding buy! F.O.B. Chicago. **21.50**

Item #126

LOGAN 4-Way, Foot Operated AIR VALVE, Item #59. Model 6520—Ideal for operating air vises, presses, air machinery, and other double acting pneumatic devices. Heavy cast construction. Standard ½" pipe thread ports. Overall dimensions 8½" x 5¾" x 7½". Gov't. Acquisition cost $42.00. Shipping weight 28 lbs. An outstanding buy. F.O.B. Chicago **15.00**

ITEM #59

BE PREPARED — WAR SURPLUS GENERATING PLANTS — IMMEDIATE DELIVERY

Available for Immediate Delivery • Large Stock • Many Sizes from 350 Watts to 25 KVA

ITEM #183

Item #183 — 3000 to 4000 WATT GENERATOR SET — FEATURES — Power for your home or business. Simply connect to power panel or house circuit. • Constant voltage regardless of load. • Push button start or stop. • Easily made full automatic start or stop. **SPECIFICATIONS** — Sizes 19"x30"x48". Steel skids, weatherproof housing, requires no building. Wt. 725 lbs. • Hercules 4-cyl. 10 HP gasoline engine. Load governor. Oil filter. Quiet muffler, 6-volt starter, generator. Hobart 115 volt, 60 cycle, 3000 to 4000-watt generator. Furnishes either single or three-phase power, 2 or 3 wire. • Panel contains oil gauge, voltmeter, ammeter, circuit breaker, voltage regulator, start button. Today's cost over $1200.00. SALE PRICE. F.O.B. Chicago **465.00**

Item #300—Model C1B—3 KW—110 Volts D.C. This mighty mite develops 3KW—28.5 amps. D.C. Standard Delco generator direct coupled to a Model ZZP Briggs and Stratton 1 cylinder, 5-7 HP, air cooled, rope starting gas engine. Instruments include voltage control rheostat & voltmeter. Wt. 275 lbs. F.O.B. Chicago.... **295.00**

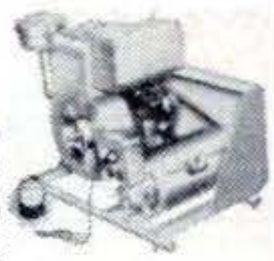
Item #201—PE 95-G—10 KW—110/220 Volt 60 Cycle A.C.—Single Phase. Totally enclosed. Onan generator direct couples to Willys Jeep, 4 cylinder, water cooled engine, push button start. Instrument panel with engine and generator instruments, circuit breaker, controls, etc. Uses 6 volt car battery. (Battery not incl.) Skid mounted. Ship. wt. 1500 lbs. F.O.B. Chicago **1295.00**

TINY TIM BATTERY CHARGER

ITEM #301

Model 125 to charge 6 and 12 volt batteries—12 volts—300 Watts; Heavy Duty Generator; Push button self-starter; 2 qt. gasoline tank in base; Ammeter; Generator cut-out; Concealed coil, etc.; Speed and charging rate control; Attractive orange finish; Weight 93 lbs.; Length, 15½", width, 11¾", Height, 14¾". F.O.B. Chicago... **89.00**

NEW GROBAN MANUFACTURE Model 251

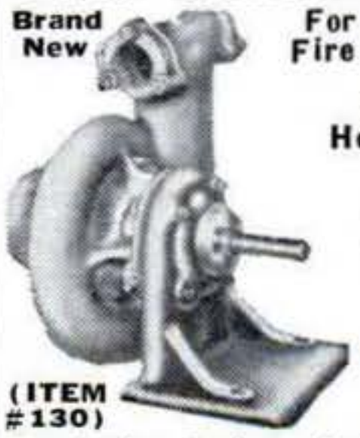


Item #2510

2500 watts, 115 volts, 60 cycles, single phase, A.C. electric generating plant, powered by dependable 6.5 H.P. Wisconsin engine—Two pole ball bearing belt driven high efficiency generator with heavy duty windings for high torque motor starting loads. Rated 3000 watts for intermittent service. Light weight portable rugged unit, easily transported to job site. Consumes 3 quarts of gas per hour at rated load. Dimensions: 24"x20"x24", ship. wt. 290 lbs. Complete with fused outlet box and voltmeter. F.O.B. Chicago **349.00**

General Motors — Allison
CENTRIFUGAL PUMP
200 GALLONS PER MINUTE

Brand New



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For Draining Basements • Fire Fighting • Irrigation • Fuel Transfer • Swimming Pools • Home Water Systems • Dewatering

Converted for high volume commercial, home, and industrial use. Standard 2½" pipe thread inlet, twin 1¼" pipe thread outlets. Ball bearing supported ¾" shaft. Easy priming. Rotation, counter-clockwise facing shaft. Gov't. acq. cost $145.00. Complete with full instructions. Ship. wt. 35 lbs. F.O.B. Chicago **39.50**

TYPICAL PERFORMANCE DATA

Suction Lift	Head Pressure	Gal. Per Min.	H.P.	R.P.M.
10'	75'	260	6.0	3500
10'	65'	200	5.2	3500
10'	80'	40	1.5	2500
10'	50'	140	5.0	3500
10'	30'	100	3.0	2500

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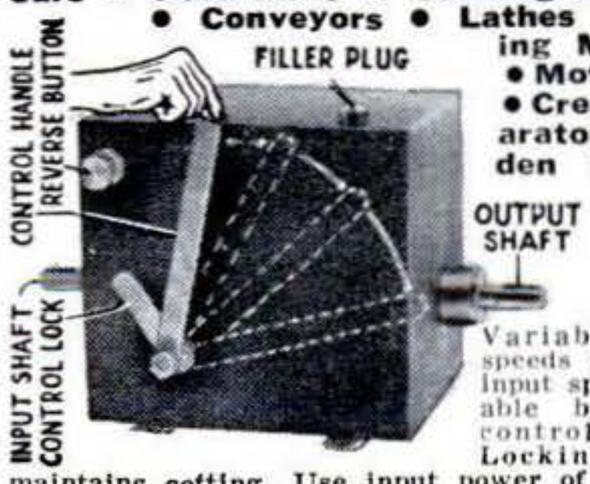
HYDRAULIC SPEED REDUCER

ITEM #115 WITH FINGERTIP CONTROL

USE FOR: • Reamer Drives • Midget Cars • Feed Mills • Canning Machines • Conveyors • Lathes • Milling Machines • MotorBoats • Cream Separators • Garden Tractors • Pumps

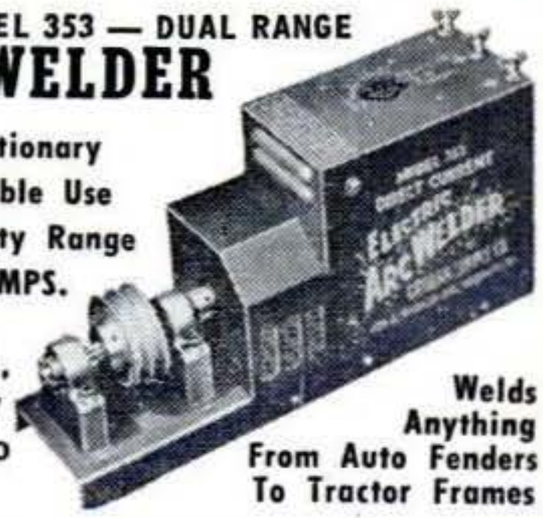


Variable output speeds from 0 to input speed available by moving control handle. Locking handle maintains setting. Use input power of ¼ to 1½ H.P. This Westinghouse-Oil Gear Unit consists of a variable displacement hydraulic pump feeding a fixed displacement hydraulic motor. Adjustable relief valves set at factory for 100 inch pounds of torque may be reset up to 180 inch pounds. Independent reverse control allows full output power and speed selection in either direction of rotation. Shafts measure ⅝" diam., include keyway. Input rotation is counter-clockwise facing shaft. Recommended input speed not to exceed 750 R.P.M. Over-all dimensions. 7½"x7½"x11½". Gov't acquisition cost. $428.00. Ship. wt. 31 lbs. Complete with 2 qts. of oil and full instructions. F.O.B. Chicago **54.50**

NEW MODEL 353 — DUAL RANGE
ARC WELDER

for Stationary or Portable Use • Heavy Duty Range To 250 AMPS.

New 'Magic Terminal' For Low Current 30 to 100 Amps



Welds Anything From Auto Fenders To Tractor Frames

IDEAL FOR • FARM • GARAGE • FACTORY • WORKSHOP. These precision engineered D. C. Arc Welders contain the highest quality War Surplus aircraft components built to exacting government specifications. They are light in weight, have oversized lifetime grease-sealed ball bearings, air cooled commentator, dial type rheostat for easy pin-point control, a high-low rheostat switch, reactor coil for even arc and the new 'MAGIC TERMINAL' low current welding range for welding lighter materials. Designed for many years of trouble-free service. Run welder from drive pulley or power take off of a tractor or Jeep, 7½ HP electric motor or 10 HP gas engine at 2500 R.P.M. Uses two V belts or flat belt. Continuous output rating 200 amps. Intermittent welding rating 250 amps, 30 volts. This sensational price includes double V or flat belt pulley and complete operating instructions. Ship. Wt. 107 lbs. $350.00 Value. **Item #65.** Now only.. **119.50** F.O.B. Chicago

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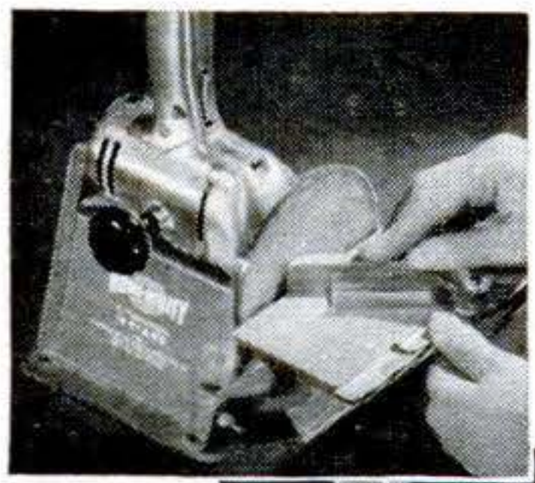
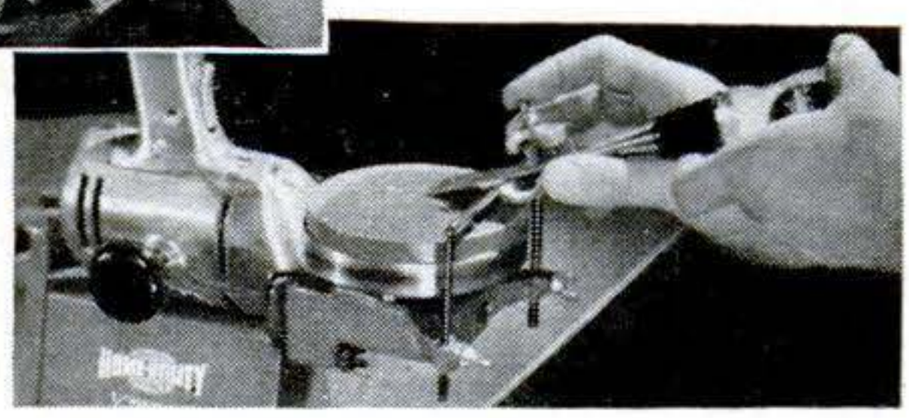


Disc Sanding Table only $7.75

Ideal for rapid, accurate sanding of picture molding, plastics and hobby parts. Easily handles small, odd-shaped, curved pieces.



Roto-Hone Attachment only $10.95

Hones knives, chisels, plane bits, lathe tools to razor edge. Clamp and guide bar for accurate angle. Stone has rough and fine sides.

PLUS stands, auger bits, masonry bits, countersinks, wire wheel and cup brushes, sanding discs, lambswool bonnets, auto polish, electric wax, saw blades, protractors, etc. WRITE TODAY for free book of job tips to: THE BLACK & DECKER MFG. Co., Dept. H1S, Towson 4, Md.

Black & Decker

UTILITY TOOLS

PORTABLE ELECTRIC TOOLS

Industry Clamors for Trained Men

[Continued from page 250]

his field, see the industry from the inside. Sometimes summer work fits right into the next year's classes. Frederick Harshbarger, who graduated in physics from Oberlin last year, worked one summer for Preco, Inc., a small company in Los Angeles. As an inspector, he noticed that plant morale was good. He dug into why this was true, wrote up his findings at college. His essay won a $50 prize.

Investing Money in Men

The college deans who try to keep men from loading up on outside work know that you can't pay your whole way through college on 10 hours of work a week. They also know that for most men a college education means increased earning power. In that case, a good student is a good financial risk. Corporations borrow money to buy new machinery to increase production—why shouldn't a man do the same? A pioneer, MIT has been making long-term loans to students for 22 years. More than $2,500,000 has been borrowed in that time by 3,600 men. About two-thirds of this has already been paid back and the younger men are sending in checks regularly. Harvard, Yale and Princeton, among others, are making more and more student loans. With a combination of scholarship, part-time work and loans, a man can make his way through almost any college or engineering school.

And by picking his college right, a man can do it on work alone. I know of a recent graduate of Ohio State who paid all his expenses after the first year by working 25 to 30 hours a week as a machine operator—later timekeeper—on a part-time shift in a local factory. He got married his junior year—and helped put his wife through school. END

Off His Game

Golfer (dubbing a shot): "I'm certainly not playing the game I usually play."
Caddie: "What game is that, sir?"—*Pure Oil News.*

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SURPLUS MACHINE SHOP TOOLS AT PRICES YOU CAN AFFORD

HIGH SPEED STRAIGHT SHANK DRILLS

SET 6J 30 selected H. S. Straight Shank Drills from 1/8" to 1/4", lengths up to 7". $15 value, only **$2.98**

SET 19J 100 HIGH SPEED DRILLS: 1/4" down. 30 new std. H. S. Drills — 70 slightly used sharp drills, lengths up to 7". $30 value. PPD. Only..... **$7.98**

SET 7J 12 Different size H. S. straight shank Drills. 1/4" to 1/2", lengths up to 7". Only..... **$3.98**

HIGH SPEED DRILLS

1/4" TO 17/32" WITH 1/4" SHANKS!

SET 35J 6 different size H. S. Drills, 1/4" to 17/32" all with 1/4" shanks. PPD..... **$2.98**

SET 36J 10 of above, PPD..... **$4.95**

Sets 35J and 36J will fit any 1/4" drill.

HIGH SPEED DRILLS

1/2" to 1-3/16" WITH 1/2" SHANKS!

5 Drills for less than the price of one new Drill!

SET 32J 5 different size H. S. Drills 1/2" to 1-3/16"..... **$7.95**

SET 33J 10 different size H. S. Drills 1/2" to 1-3/16".. **$14.50**

These new and used H. S. precision Drills with 1/2" shanks can be used in a 1/2" elec. drill or a 1/2" capacity lathe or drill press.

HIGH SPEED MORSE TAPER SHANK DRILLS

SET 9J 15 Different Size High Speed Morse Taper Shank Drills up to 9/16" with No. 1 and 2 tapers. New and used. $50 value. Priced at only..... **$6.49**

SET 10J 20 Different Size High Speed Morse Taper Shank Drills from 1/4" to 1". New and used. $70 value. Priced at only..... **$12.95**

SET 15J 10 Different Size High Speed Morse Taper Shank Drills from 1/2" to 1 1/2". New and used. $50 value. Priced at only..... **$9.95**

SET 37J 8 Different Size High Speed Morse Taper Shank Drills from 1" to 2" with No. 3, 4, and 5 tapers. New and used. $125 value. Priced only **$29.95**

NEW MOUNTED STONES

SET 27J Mixture of 12 Mounted Stones with 1/4" shanks. PPD.... **$2.95**

HIGH SPEED WOODRUFF KEY SEAT CUTTER

SET 4J 5 different size cutters. Can be used as mounted milling cutter or circular saw. All with 3/8" and 1/2" shanks, widths up to 1/4", dia. up to 1". New and used. Ppd. Priced at only.... **$3.95**

NEW ROTARY FILE MIX

7 different pcs., High Speed 1/4" shank, PPD. . **$4.49**

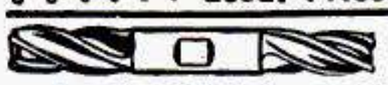
SET 22J 14 different pcs. as above, PPD. **$8.79**

H. S. TAPER SHANK CHUCKING REAMERS

SET 25J 15 Different Size High Speed Morse Taper Shank Chucking Reamers up to 1/2" with No. 1 and 2 tapers. New and used. Priced at only..... **$7.95**

SET 13J 8 Different Size High Speed Morse Taper Shank Chucking Reamers from 1/4" to 1". New and used. Priced at only.. **$6.95**

DOUBLE-END END MILLS



SET 29J 4 right hand H. S., 3/8" straight shank End Mills up to 3/8" dia..... **$3.98**

6 SLITTING SAWS WITH MANDREL

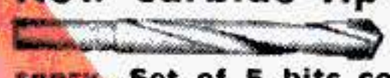
SET 34J 6 Different Size High Speed Slitting Saws, 5 pcs. 2 3/4" dia. x 1" arbor, plus 1 pc. 5" dia. x 1/2" arbor. Thickness from .040 to .071. Cuts wood, aluminum, brass, steel, etc. PLUS SPECIAL MANDREL which enables use of saws in 1/4" or 1/2" elec. drill. $25 value. PPD. Only..... **$4.95**

7 selected, sharp H. S. Slitting Saws as above to use on your own mandrel or milling machine. New and used. PPD. A bargain at..... **$4.95**

NEW HIGH SPEED COMBINATION DRILL AND COUNTERSINKS

SET 2J 8 selected sizes from A1 to F2 (3/64" drill x 1/8" body to 3/16" drill x 7/16" body) 60° angle of countersink. New cost on these countersinks 75c to $2.50 ea. Priced to you Ppd. at only..... **$3.98**

New Carbide Tip Masonry Drills



Carbide tip goes through any masonry. Set of 5 bits containing two 7/32" & three 1/4", all five, $10 value, only..... **$2.75**

NEW 360° SWIVEL TYPE TOOL HOLDER & BORING BAR

Here is a tool that will do the work of a left, right and straight tool holder, plus a boring bar, all for a fraction of its original cost. PPD to you.

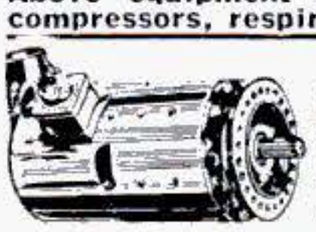
- TOOL A takes a 5/16" sq. bit or 5/16" dia. boring tool. Shank size 9/16"x1"x4 3/4". PPD. Only..... **$3.29**
- TOOL B takes a 3/8" sq. bit or 3/8" dia. boring tool. Shank size 5/8"x 1-3/16"x5 3/4". PPD. Only..... **$3.95**
- TOOL C. Cut-off blade holder for 3/32"x 3/8" blade. Shank size 1/2"x1"x4 1/2" (can be changed to fit other size cut-off blades). PPD. Only..... **$2.25**
- TOOL BIT SPECIAL: 12 H. S. 3/16" sq. x 2 1/2" new tool bits. PPD..... **$1.95**

AIR TANK—REGULATOR—MASK

- A4 Tank, 5" x 8". 104 cu. in. vol. 500 PSI $1.50
- Demand Type Regulator complete with 500 PSI pressure gauge. Fits above tanks.....$1.50
- Mask complete with 14" of hose. Outlet valve. Fits above regulator.....$1.60

Above equipment suitable for air tanks, compressors, respirators, diving units, etc.

GENERATORS!



P1 GENERATOR 200-amp. 24-volt, continuous duty. Wt. 48 lbs. Special closeout price. F.O.B. Tulsa..... **$14.98**

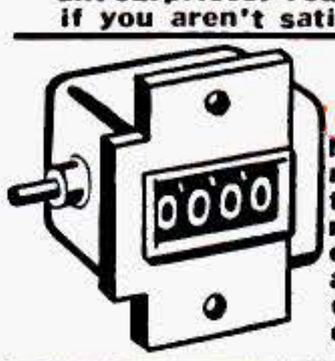
ESA GENERATOR: 50-amp. 12 volt continuous duty. Wt. 21 lbs. F.O.B. Tulsa. Only..... **$6.95**

These used, guaranteed serviceable aircraft quality generators are easily convertible for welders, power plants, boats, platers, etc.

BARGAIN TOOL & SHOP MIXES—PPD.

- 30 GRINDING WHEELS 1/4" arbor, 4" diameter max..... **$3.29**
- 2—8" WIRE WHEELS coarse and fine, 1" thick, 5/8" bore. Pair only..... **$2.29**
- 300 SPRINGS all types and sizes..... **$1.79**
- BEARING MIX: About 40 needle, ball and roller bearings; new and used. Up to 2 1/2" dia. approx. 5 lbs. Outstanding buy at..... **$2.95**
- SURPRISE MIX: Over 50 pcs. for your 1/4" elec. drill including rotary files, drills, bits, reamers, grinding wheels and arbors for our customers who like pleasant surprises. Your money back if you aren't satisfied..... **$2.98**

NEW VEEDER ROOT COUNTERS



Non-reset, clock-wise rotation type. A counter for gadget experimentation, motor RPM, etc. Available in 3, 4, and 5 digits. Your choice, only.....**$1.00**

HYDRAULIC BARGAIN DEPT.

- Any length
- Std. Pipe Connections

1/4", 3/8", and 1/2" ID Available
1/4" hose has 1/4" male pipe connections.
3/8" hose has 3/8" male pipe connections.
1/2" hose has 1/2" male pipe connections.

Length in feet	Price 1/4" ID	Price 3/8" ID	Price 1/2" ID
1	$ .75	$1.50	$1.65
2	1.00	2.25	2.40
3	1.20	2.75	2.95
4	1.45	2.95	3.10
5	1.70	3.40	3.60
6	1.95	3.60	3.75
7	2.30	3.75	3.95
8	2.30	3.75	3.95
9	2.30	3.75	3.95
10	2.30	3.75	3.95

11 to 50-ft. lengths available at 15c per ft. for 1/4" ID Hose—30c per ft. for 3/8" ID Hose—40c per ft. for 1/2" ID Hose. Above prices quoted complete with fittings. Finest construction double wire internal braid. 1/4" ID Hose will carry 3 GPM at 1000 PSI. Use for hydraulics, steam, air, etc. Large quantities available at greatly discounted prices.

PESCO HYDRAULIC GEAR TYPE PUMP

Rated at 3 GPM, 3750 RPM, 1500 PSI. 1/2" drive spline. Gov't cost over $90. Yours for only..... **$9.49**

NEW VICKERS MF9, 6 H. P. Hydraulic Motor

Unit is compact, powerful. Displaces .507 cu. in. per revolution, 6 gal. per min. at 3000 RPM, 1500 PSI. Positive displacement. Angle type. Rated at 6 H P. Rotates either direction. Unit can also be used as a pump. Here is the finest hydraulic motor available at a fraction of its new cost of over $200. Our price only..... **$19.95**

NEW VICKERS HYDRAULIC MOTOR: serial no. MF1071130BCF2, cu. in. displacement per rev. .378, 3600 RPM 1000 PSI, (unit similar to above only a smaller displacement and H.P.) only.....$16.50

MOUNTED POINTS WITH 1/8" AND 3/32" SHANKS

Assortment of:

10 stones	$1.20
25 stones	$2.75
50 stones	$4.50

NEW SURPLUS PRESSURE GAUGES

2 1/2" Dial. Following pressures available: 30"-0-60#, 0 to 600#, 0-30#. Your choice $1.30

4 1/2" Dial. Std. quality gauges; std. pipe connections. Finest brands. Retailing at $7.00 and up. Following pressures available: 0 to 15#, 30"-0-100#, 0 to 100#, 0 to 160#, 30"-0-200#, 0 to 700#, 0 to 800#, 0 to 1,000#. Your choice, only.....$4.00

Gauges suitable for steam, air, oil, gas and water. Discounts on quantities.

AUTO TEST VACUUM GAUGE: 4 1/2" Dial, 30"-0. You can pay up to $14.00 for this gauge. PPD, only.....$3.25

NEW HAND TOOL BARGAINS!

A must for you at this low price!

- 17-pc. 1/2" DRIVE SOCKET SET: contains flex handle; sliding T; speeder handle; U-joint; and 12 sockets to 1", only...$7.50 plus 85c postage.
- 14-pc. 3/8" DRIVE SOCKET SET; contains ratchet; sliding T; speed handles; flex handles; 3 extensions; 7 sockets to 3/4", only.....$6.95 plus 50c postage.
- 10-pc. Heavy Duty Box End Wrench Sets: size range 5/8" to 1 1/2". A wonderful new surplus buy at $6.75 plus 1.00 postage.
- ADJUSTABLE WRENCH SET: 6", 8", 10" with polished head, $3.00 plus 20c postage.
- DRILL PRESS VICE: 2 1/2" jaw opening, 2-7.6" jaw width, machine "V" grooves. Wt. 4 1/2#. Only $2.50 plus 60c postage.
- HEAVY DUTY VICE: 3" jaw width, 3 1/2" jaw opening. 180° swivel, anvil face. Wt. 10#.....$4.25, plus $1.15 postage.
- New 1/2" ELECTRIC DRILL: 1/2" Jacobs hand chuck. Plus 12 H.S. bits to 1/2", FREE of additional cost.....$27.95

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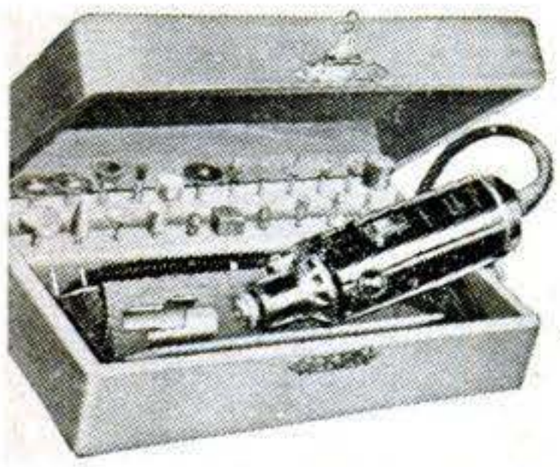
T & T TOOL 221 W. SECOND TULSA, OKLA.

MOST PRACTICAL TOOLS YOU CAN OWN!

DREMEL Electric MOTO-TOOL
1001 USES AROUND THE HOME AND SHOP

Here is the fastest (27,000 r.p.m.) most powerful tool in its class — THE ORIGINAL POCKET-SIZE MACHINE SHOP. A jack of all trades around the workshop, it is indispensable for carving, drilling, grinding, and for sharpening tools, scissors, kitchen knives, garden tools, lawn mower blades, etc. More versatile than a ¼" electric drill as it is so light weight (13 oz.) and handy for so many small jobs. Perfect for drilling small holes to hang pictures, installing cabinet hardware, hardwood trim. Powerful, 110 V. A.C.-D.C. motor. A tool built for years of lasting service.



MOTO-TOOL NO. 2 Offers more convenience and long life features for the money than any other hand grinder. Thousands of satisfied users. Moto-Tool No. 2 (with 1 emery wheel point) **$16.50**
KIT NO. 2 Includes Model 2 Moto-Tool and 23 Accessories (High-Speed Steel Cutters, Grinding Wheels, Polishers). Packed in sturdy hardwood case..... **$23.50**

A PRECISION TOOL WIDELY USED IN INDUSTRY

For Sharpening Tools

Speeds Up Repair Jobs

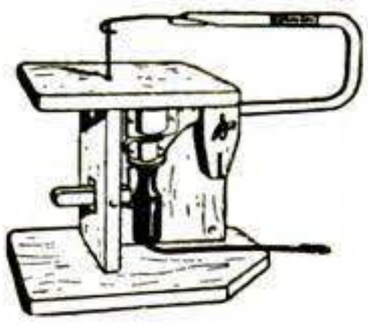
Great for Hobbyists

AMAZING FOOT-A-MINUTE
(7,200 Strokes Per Min.)
CUTTING SPEED!

ELECTRIC DREMEL POWER TOOLS
ONLY **$5.85** with 3 saw blades

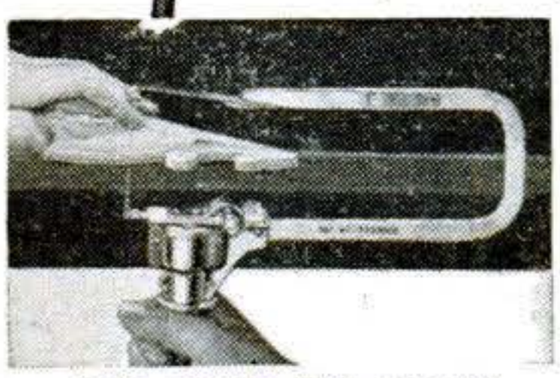
FREE PROJECT PLANS

Make your own jig saw. Complete plans and six project patterns included FREE.



FAMOUS DREMEL ELECTRIC MOTO-SAW

Here is a genuine craftsman's tool with dozens of household and workshop uses. It is perfect for all sorts of coping and jig saw work, making window valances, knick-knacks, hobby projects, etc. High-speed, reciprocating-type motor easily cuts asphalt and rubber tile, also masonite and formica — wood up to ¾". Perfectly safe for children—so easy to handle that women love to use it. Has only two moving parts, never needs oiling. A high quality tool used by craftsmen, tile layers, and carpenters.



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SEE YOUR DEALER! If he can't supply, order direct on five-day trial, money-back guarantee. Remit in full for postpd. shipment; or, send $2. now, pay postman balance plus postage and C.O.D.

DREMEL MFG. CO. **Dept. 123-A, Racine, Wis.**

They're Living Off Another Planet

[*Continued from page 135*]

year, U. S. newspapers carried reports of mysterious objects sighted in the skies.

Up until late December, the authors kept Vana and Garry Verth on Earth. But Vana, in return for a horse-and-buggy ride, had promised Garry a ride in a flying saucer, and now the two are off. They will make an extended stopover on a space station revolving around Earth (those enterprising females beat us to the punch on that construction job) before continuing on to Terra. Once they get there, goodness knows what will happen to Garry. The girls may fall out among themselves vying for his favors or they may raid us for more men.

Editors Hesitated to Use Strip

"Twin Earths" seems so plausible that the editors of at least one large city newspaper hesitated to publish the strip. They remembered how Orson Welles had scared the daylights out of radio listeners with his realistic imitation of a Martian raid on New Jersey. They were afraid a lot of their readers would mistake the logical fantasy of "Twin Earths" for fact. So they called in their science expert for consultation.

He pointed out that Pythagoras had anticipated Lebeck by about 2,400 years. That intellectual Greek had estimated that there were 10 planets in our universe, though only five were known in his day. He called one of the unknown five Counter-Earth, and figured that it was revolving in an orbit that kept it forever hidden from us.

Reassured, the newspaper editors decided to take a chance on letting their readers follow the adventures of Vana and Garry Verth. END

From Pillar to Pole

THE Sunday-school teacher was describing how Lot's wife looked back and suddenly turned into a pillar of salt.

"My mother looked back once while she was driving," contributed little Johnny, "and she turned into a telephone pole."—*Friendly Chat.*

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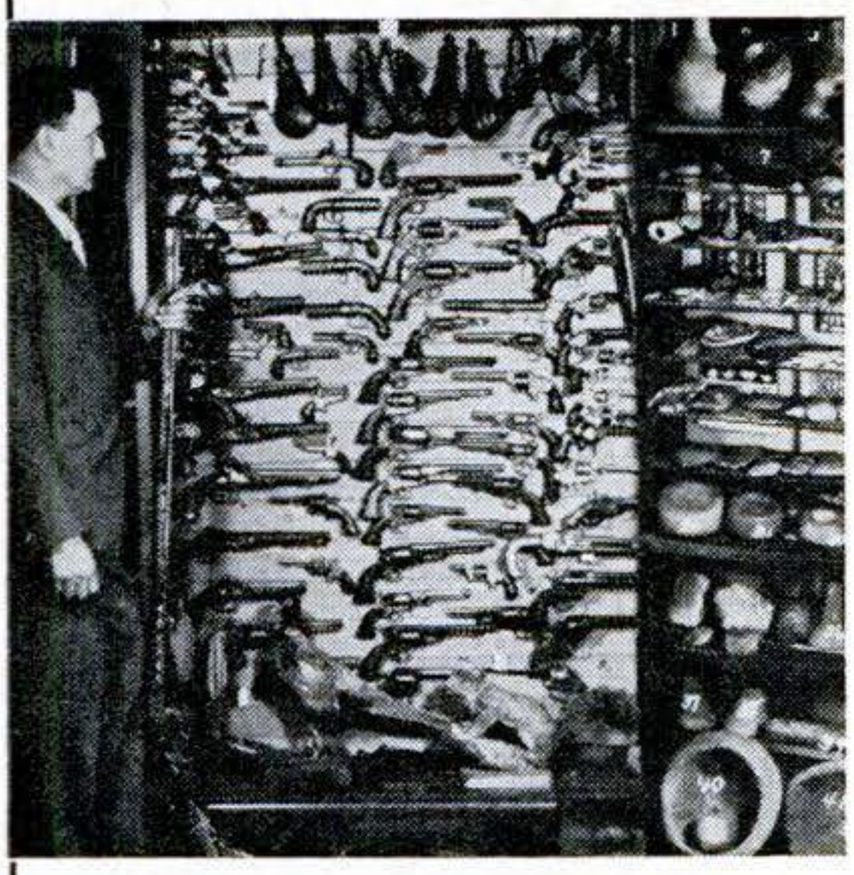
1953 *Heike's* Hobby Catalog #19 35c



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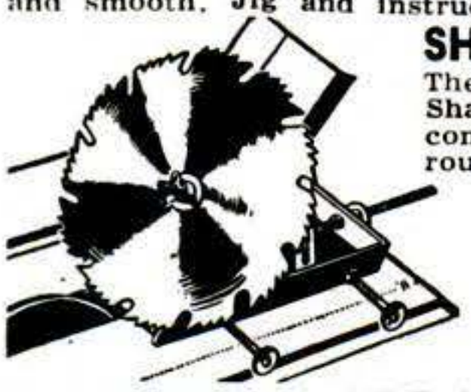

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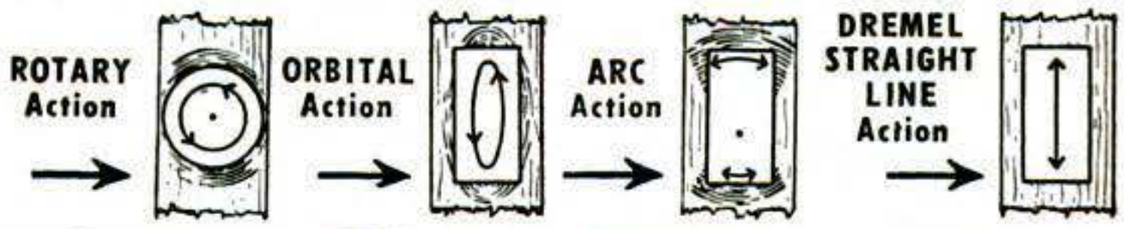
Professional Model 2000 is a favorite with carpenters, painters, contractors and family handymen! Ideal for finish sanding on flush doors, panelling, cabinets, etc. Superb for waxing cars, polishing furniture, etc.

A "must" for dry-wall joints. Sands into tight corners. Ideal for refinishing.

TRY THIS SIMPLE TEST: Sand a piece of wood by hand, using the four motions below. Note slightest cross-grain action produces scratches and swirl marks. Sanding *with-the-grain* gives scratch-free satin finish. This test proves conclusively why professional craftsmen always sand with-the-grain—never cross grain.



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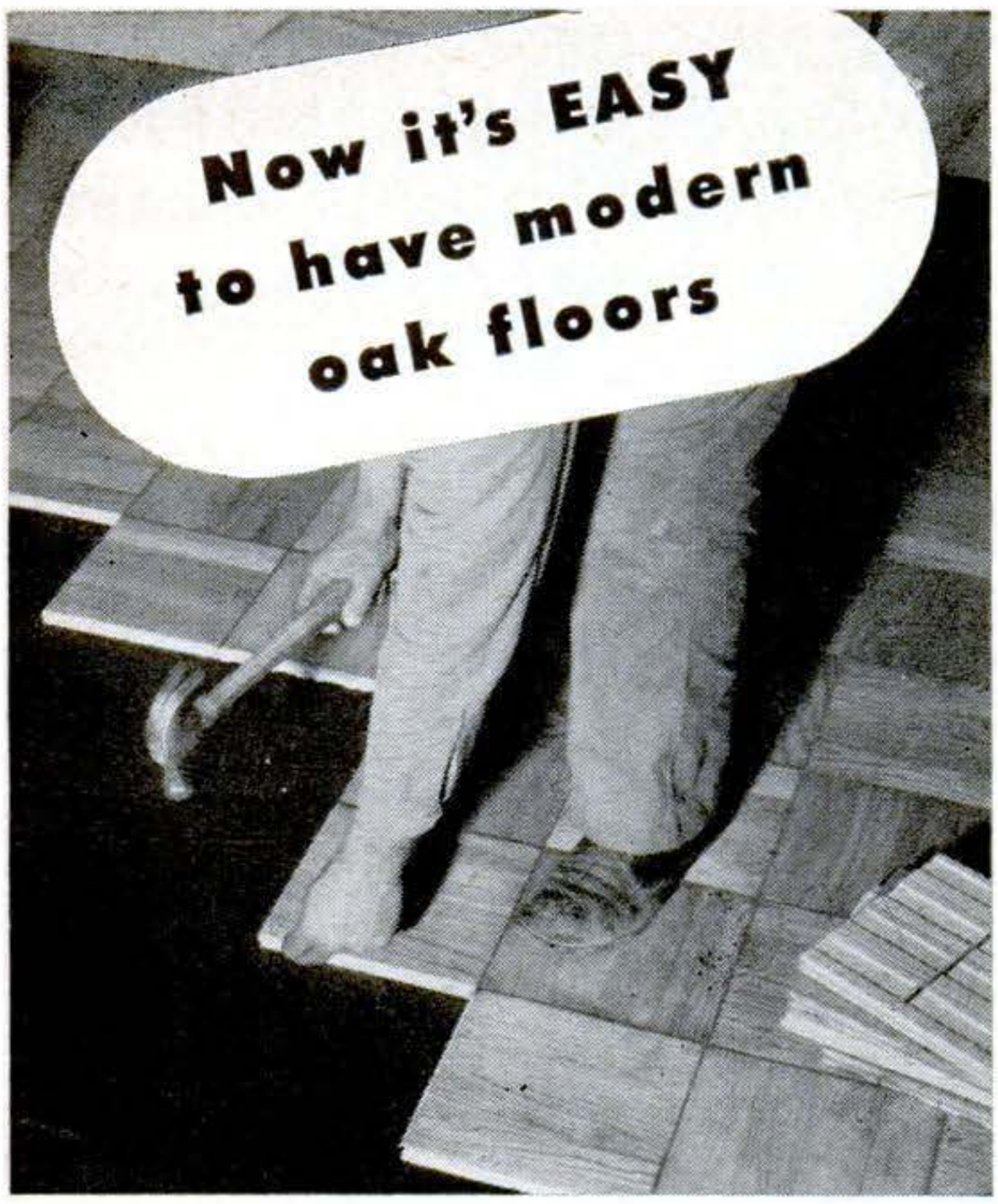

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Gus Fixes Their Wagon

[Continued from page 196]

"He's pulling something! Let me slap him around! Let me slap—"

"Hold it! Try again, buster. This is your last chance."

Gus shrugged his shoulders and fiddled with the engine aimlessly. The gunman's threat rang a bell somewhere and as he puzzled over it, he reached down with a wrench, deep beyond the glow of the lamp, and loosened some bolts.

Slap around . . . slap . . . something about the word was as familiar as a nursery rhyme, a missing ingredient, teasing at the edge of his mind.

New Points Turn the Trick

"Trying to think! Bouncing his skull on the concrete would help."

Bouncing . . . it happened again. Bouncing was a result of varying degrees of flexibility, a springiness . . . a spring . . . slap and bounce! That was it!

"Okay, move that miserable friend of yours out of my way. I think I've found your trouble."

"It's about time!"

Gus went and got a new set of distributor points. The others had seemed all right, but actually they were what caused the car to sputter at high r.p.m. The constant flexing of the point spring over a long period of time had gradually sapped its strength until the spring failed to keep the contacts closed for the proper length of time. The spring was allowing them to slap and bounce at high r.p.m. The resultant charge of electricity reaching the plugs was too small to keep the engine running properly.

Gus Reaches the End of His Rope

It wasn't what Gus would call a common ailment. Being about the least expensive part of an engine, points were usually changed fairly regularly. But there were some home tinkerers who had the idea that clean points meant the distributor was in good order, no matter the age. Gus figured the Zephyr's owner was like that.

He installed the new set, adjusted them to the proper setting and raced the engine. It was smooth as fine oil.

"Okay. She's fixed. Now get out of here and leave me alone!"

"With pleasure, buster, but there's one

[Continued on page 258]

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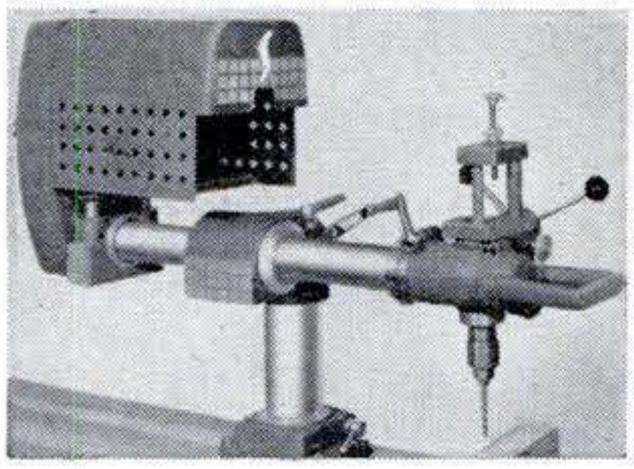

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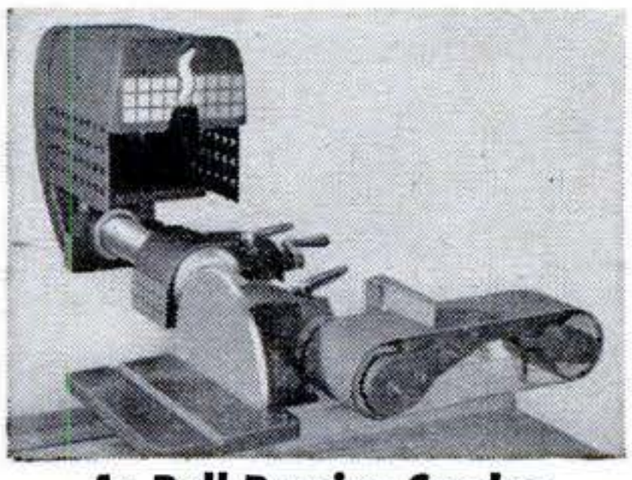

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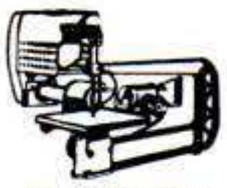

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The Mark of Superiority

Gus Fixes Their Wagon

[*Continued from page 256*]

thing more—just so you won't holler copper for a while."

The two men grabbed him and trussed him up with a length of rope Gus kept in a corner. Then the one with the gun ripped the telephone off the wall and dropped it near Gus.

"Something to amuse yourself with! So long, grease ape!"

The two convicts jumped in the car, backed out with a squeal of rubber and roared down the street.

Stan to the Rescue

Gus struggled with the rope, but the cons had done too good a job. He relaxed his muscles and waited. At least Stan hadn't gotten mixed up in it. *Might have tried something rash,* he thought. *These young squirts . . . say, what's keeping that kid?*

As if in answer to his thoughts, a car drove up on the concrete apron outside, and a cracked voice called out: "Hey Gus! You in there?"

"Hurry up, Stan! Get me out of these ropes. I've got to get to a phone. I'll explain later."

They drove to a drugstore a couple blocks away, and Gus ran inside. He dialed a number, and Officer Billy Ryan answered.

"This is Gus, Billy. You on the lookout for a couple of escaped cons?"

"Yeah, we been watching for 'em. Why?"

A Tip for the Cops

"Well, they've just left my garage—they're headed for Chicago. But I think you'll find them a short distance out of town on the westbound highway. Their car will break down, probably in the next 15 minutes or so. It's a black 1940 Lincoln Zephyr. You can't miss it!"

Gus could hear Ryan shouting at the dispatcher to send a car out and call the highway patrol for assistance.

"Hope you're right, Gus. But how do you know the car will break down?"

Gus told him how he had fixed the car, and of the other "adjustment" he had made.

"Nice going, Gus. You pulled a neat trick! So long."

Gus went back to the car and drove Stan home. He told him the whole story.

It *was* a neat trick. Only mechanics and a few owners of that model Zephyr would

[*Continued on page 260*]

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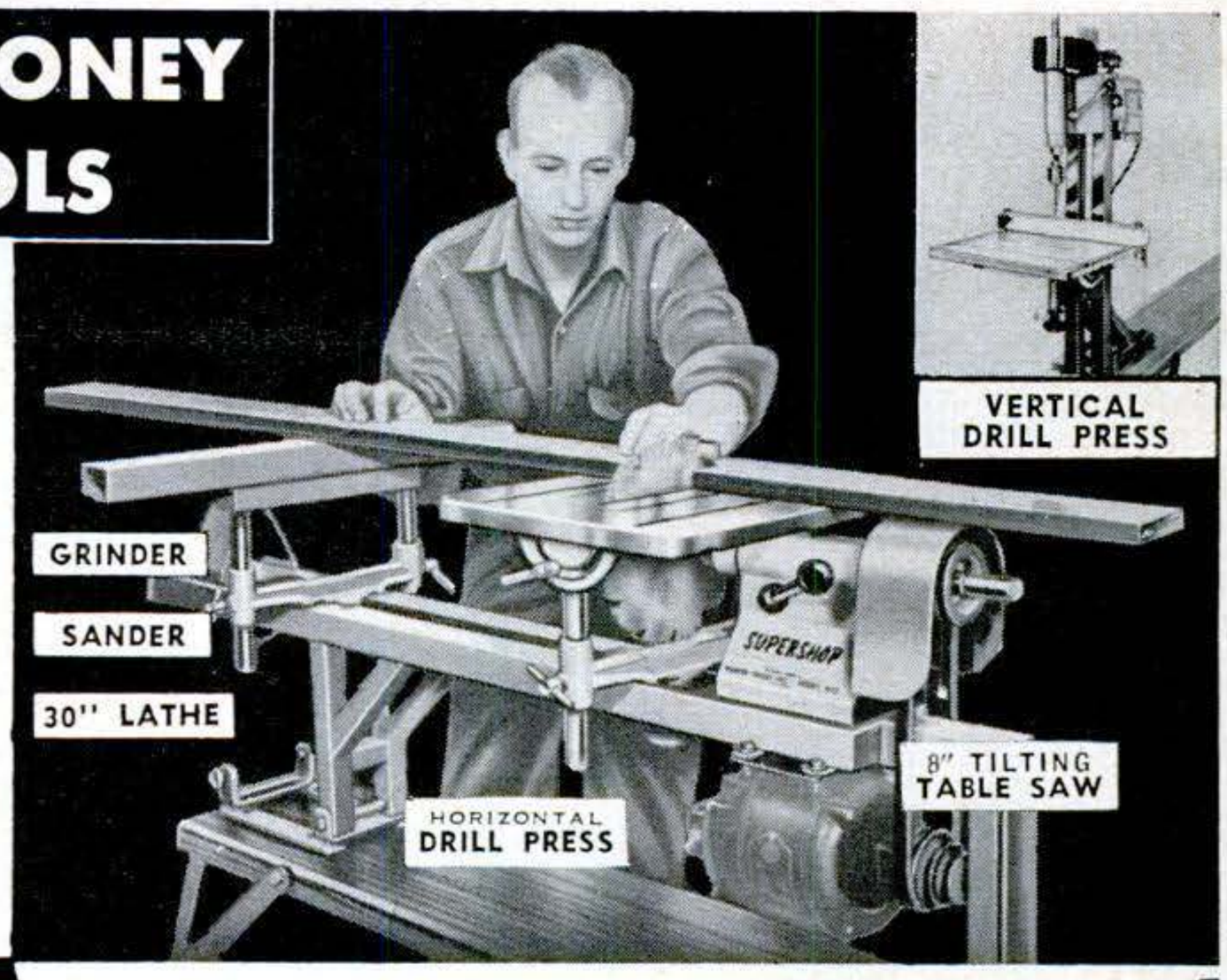

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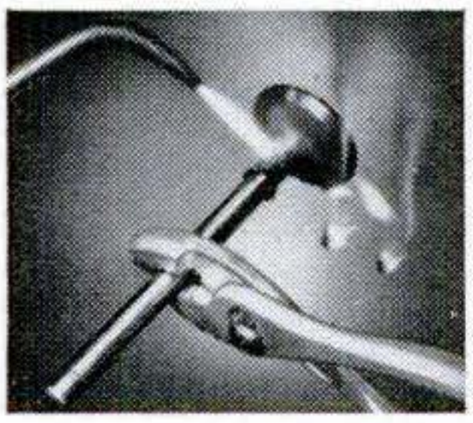
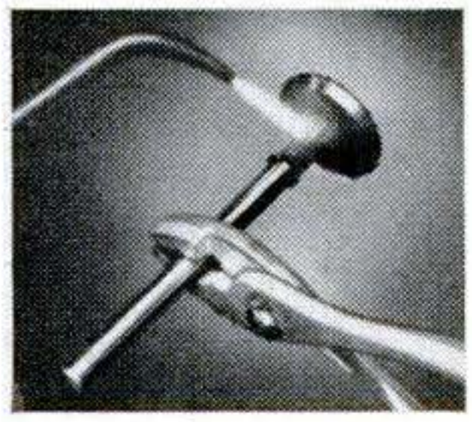
Miracle Power Lubricates When Oil Burns Off





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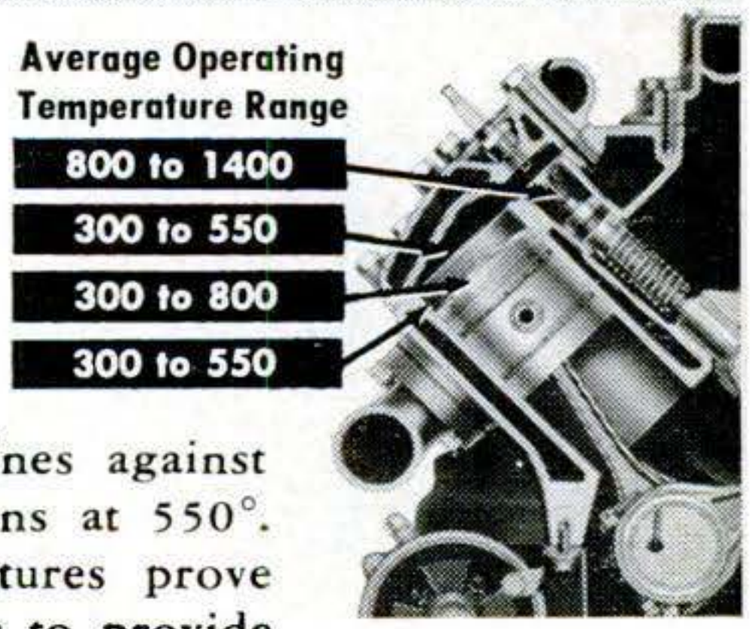

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During stops, oil drains off vital engine parts and it takes up to five minutes to pump it back after starting. Meantime, dry metal grinds against dry metal. Result: wear . . . lost power . . . repairs.

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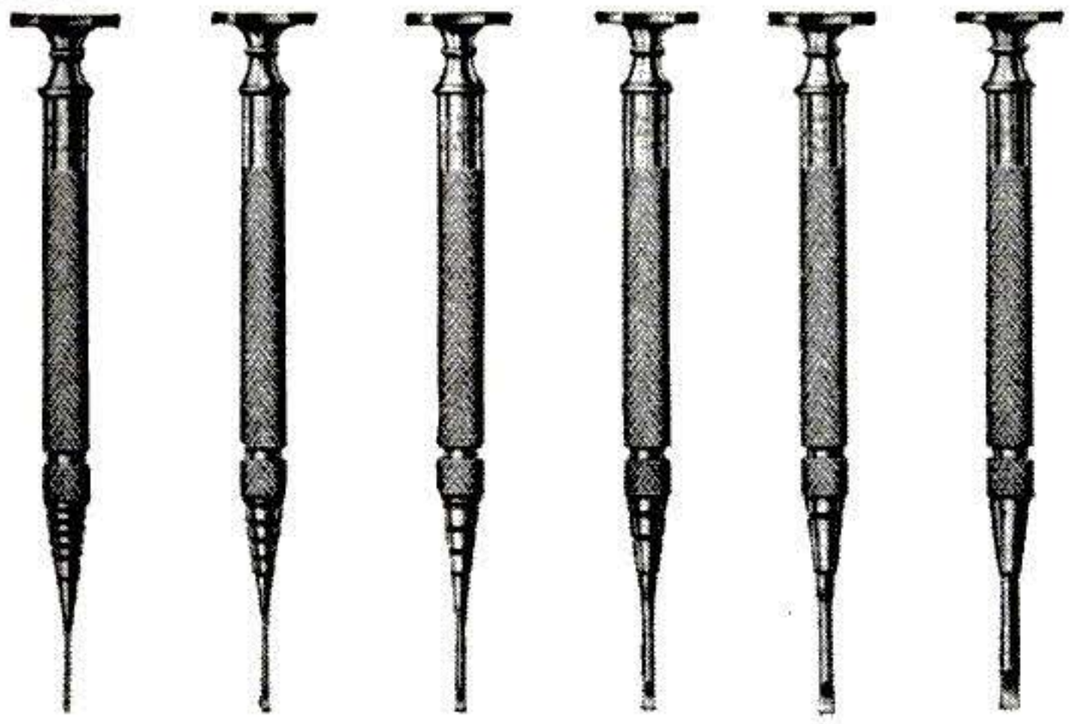

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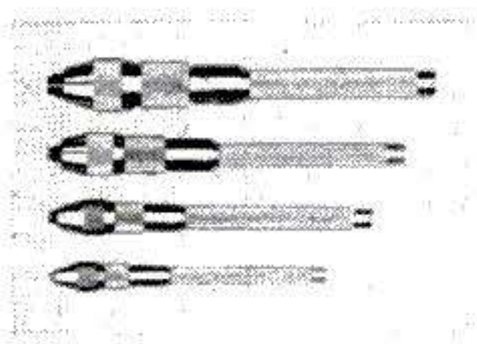

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Gus Fixes Their Wagon

[*Continued from page 258*]

know about it. Once, a 1940 Zephyr had come in behind a tow truck with its radiator torn to pieces, and Gus had discovered that on that model the radiator was fastened only at the bottom. Sometimes, if the bolts loosened a little, and if the car was moving fast enough against a strong wind, the radiator just leaned into the fan blades. The result was a frightening noise, loss of coolant, and an overheated engine freezing up.

"Say, that's a pretty good stunt, boss!"

"Sure, if it works and they catch them." He stopped in front of Stan's house.

"You know, since I'm working for such a smart boss, my job is on a higher level than I thought. Don't you think I ought to have a raise?"

Gus took a playful swing at Stan as the young man jumped out of the car and said good night.

Gus Gets Some Good News

Gus had finished dinner and was settled down by the radio when the phone rang. It was Billy Ryan.

"I thought you'd be interested in how things turned out. We found the car abandoned at the edge of the road—"

"You didn't catch them, then?"

"Wait a minute! A little girl came running up to us. She was on the way to a neighbor's after sneaking out the back of her house to get help. Said there were a couple of bad men getting ready to shoot her folks. Well, we got there just in time. They're in our little cage right now. And tomorrow they'll be heading back for the big gray walls—thanks to you, Gus."

Gus grinned and glanced down at his wrists—they were still sore from the ropes the cons had tied him up with.

"Don't mention it, Billy," he said into the phone. "Always a pleasure to help out the law." END

Next month: Gus meets a news deadline.

Put in Her Place

A YOUNG wife just learning to drive had hopelessly gotten traffic snarled up in trying to make a left turn at an intersection. Excitedly she turned to her husband and asked what to do.

"I don't know," he replied calmly, "but I'm sure if you climbed into the back seat you could figure it out."—*The Right Hand.*

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- **Search Lamp Bulbs** 4,800,000 C.P. output! 24-volt (6 for **$7.49**) 110-volt **$1.95**

WATER PUMPS and SYSTEMS

Save up to 60%. Ask us for expert advice on your problem. Pumps for wells, basements, weed spraying, septic tanks, garden irrigation, etc.

- **Centrifugal Pumps.** Cast iron, stainless steel shaft, bronze impeller, ball bearings. No. 75, ¾", **$18.90;** No. 100, 1", **$28.90;** No. 150, 1½", **$35.60.**
- **Bronze Rotary Pumps.** *Low pressure* (25 lbs. max.) Self priming. No. 12, ½".....**$12.75;** No. 34, ¾", **$16.95;** No. 101, 1", **$22.95;** *Hi-Pressure type* (150 lbs. max.) No. 612, ½" **$14.50;** No. 634, ¾", **$20.95;** No. 610, 1", **$27.95.**
- **Irrigation War Surplus Pump.** 10,000 g.p.h. 2½" intake. Two 1¾" outlets, Special....**$39.50**
- **Burdex Shallow Well System.** 110-volt, 60-c, 300 g.p.h. 40 lbs. pressure, fully automatic. Easy to install.....**$69.50**
- **Adj. Auto Pressure Switch, $4.95;** ¾" foot valve. **$2.49;** pressure gauge 0-60 lbs. **$1.89;** also hose, strainers, etc. at real savings.
- **Hand Pump.** Lever type, high capacity, Pump basements, tanks on farms, etc. Cost $35, **$27.80**

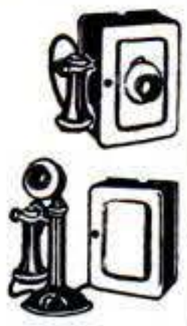
Write for useful Water Pump Data-Catalog

Miscellaneous Surplus Bargains

- **Surveyors Farm Level**.....**$37.95**
- **Surveyors Level-Transit** **$77.50**
- **Laboratory Small Microscope** (200X) **$13.95**
- **Navy Inflatable Life Belts**.....**$1.09**
- **Auto Illuminated Compass**.....**$6.95**
- **Binoculars.** Top Quality, 7x50.....**$42.95**
- **NAVY Thermometer** (5" dial) with 5' tube. Shows outdoor temp, −40 to 120°. Cost $49.50. SALE **$9.85**

SPECIAL FOR THE MONTH

WESTERN ELECTRIC CITY TELEPHONES



- Genuine W.E. wall or desk phones, same as used on city telephone systems. Useful for inter-communication, private system, extension ringer, etc. Specify "wall" or "desk." Original cost over $20.00. Prepaid Sale, **$4.99** each. Two for **$9.69**

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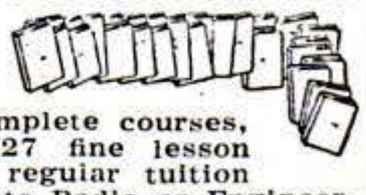

- Famous engineering school closes because of high operating costs. We offer limited quantity of complete courses, Radio or Electrical (27 fine lesson texts) at fraction of regular tuition rate. Deal #1, Complete Radio or Engineering Course Texts. **$5.95.** Deal #2, Combined Radio and Electrical Course Texts, **$9.95**

AIR COMPRESSOR UNITS

Paint, blow up tires, control termites, clean greasy engines, blow dust, etc. Build your own or buy ready-built units.

- **DeLuxe Air Kit.** Consists stainless tank 12"x24", finest 1-cyl. 3 cfm piston compressor, valves, gauge, fittings, hose, excellent paint gun, blow gun, pressure regulator, chuck and "How To Build Portable Outfit." Special **$45.49**
- **Economy Air Kit.** Same as above except 6"x24" tank and no regulator or paint gun. Each.....**$31.90**

- **Air Components.** Top quality. 1-cyl. piston-comp. **$20.50;** 2-cyl. pis. comp. **$49.50;** Adj. Auto. pressure switch, **$4.95;** pressure regulator, **$2.65;** Adj. safety valve, **$1.95;** Pressure gauges, 0-160 lbs. **$1.89.**
- **Air Operated Power Grease Gun...$23.95**

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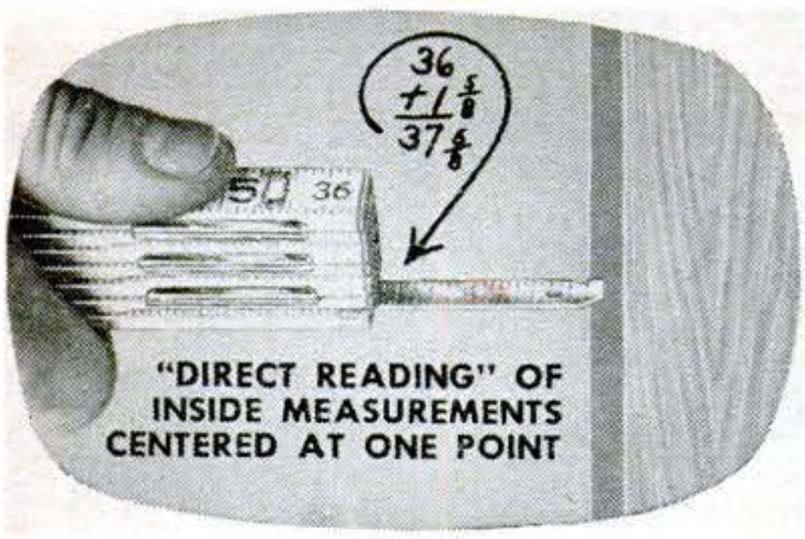
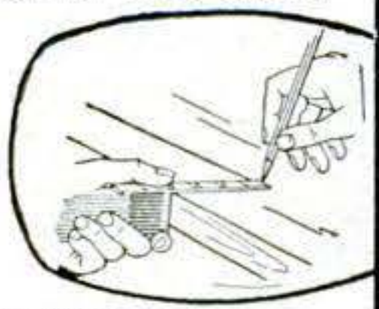


NEW STANLEY "100 PLUS" EXTENSION RULE No. X226

Make no mistake, the new Stanley "100 Plus" Extension Rule is the handiest, most versatile folding rule you can buy.

Read it four ways — on inside measurements using slide, entire reading is centered at one point — no chance for errors; may also be used as an ordinary extension rule for inside measurements, and as a regular folding rule reading from either end.

Use it as a marking gauge for measurements in 2" and 4" multiples.



CHECK THESE "100 PLUS" RULE FEATURES:

- Easy to read Big Black Numbers on White Sticks.
- Square ends — butt flush with work.
- Opens to even inches at end of each stick.
- Handy for end-to-end measurements — opens in 6" multiples to full length, 72".
- 8-inch Brass slide removable for use as depth gauge.
- New plastic finish wears four times longer.
- Extra Thick Rock Maple Sticks graduated all edges.

For real rule value ask for the X226 at your hardware dealer's. $2.65 each.

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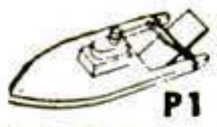
Hardware • Tools • Electric Tools • Steel Strapping • Steel



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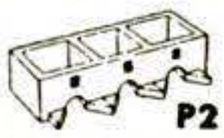
Ideal gifts for the youngsters.
Two sets — 6 full-size patterns in each.



SEND TOY PATTERNS NOW!

Stanley Tools, 413 Elm St., New Britain, Conn.
(In Canada: Stanley Tool Co. of Canada, Ltd., 413 Stanley St., Roxton Pond, Quebec)

Enclosed is.....**Send Patterns checked**

.....**Patterns P1 (25c)** .....**Patterns P2 (25c)**

Name.....

Address.....

City and State.....

The Mounties Become Mechanics

[*Continued from page 101*]

young woman who fed one holdup man in a cubicle-like cell while her husband roamed the muskeg in search of a confederate.

Wife Holds the Fort

When the constable returned with the other criminal, I asked if he had not been worried about his wife. "No," he answered. "She's the best jailer, radio operator, car driver the force could hire."

Although the Mounties are more dependent upon mechanical equipment than ever before, an inhibition restraining the use of one particular piece of equipment still prevails from deep in the force's past. This item is the revolver. "Never fire first!" is a warning passed on to new Mounties.

In the frontier town of Prince George, where burly loggers from the pine woods and strapping jackhammer crews from the vast Kitimat power project often come for a wild week end, I had coffee and hot cakes with a rangy constable who had broken his right hand on stubborn jaws three times in a year and a half. "But I never threatened a drunk or a bully with a gun," he assured me.

Order Without Gunplay

Does the Mounties' reluctance to shoot ever imperil their own lives? In Montreal in 1950 a bank robber killed an unarmed Mountie constable. Grim men flung a network of sharp eyes and pointed questions across the nation. Five months later the slayer was caught near Big Beaver, Sask. Within another five months he had dropped through a gallows trap door.

The late Assistant Commissioner Denny La Nauze once said to me: "A policeman who shoots first and asks afterwards will nick a friend as well as foe. A policeman whom it is positively dangerous to shoot, because retaliation will be rapid and sure, can get his commands obeyed without threats."

Despite the airplane and the motor car, troopers journeyed 48,475 miles by dog

[*Continued on page 264*]

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with beautiful colored walls and floor

PLASTEX gives long-lasting protection against water. Also bright, colorful, easily washable walls and floors. Basements painted with PLASTEX in 1939 are still dry and attractive. Water up to 10 ft. has been successfully kept out by PLASTEX.

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PLASTEX is also excellent for use in kitchens, bathrooms and for interior trim—where resistance to water, grease, etc. is necessary. PLASTEX is available in many colors making possible lovely color combinations. Easily applied by brush.

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"I have taken in 100 mowers in 5 weeks since I got my Foley,—with no advertising," says George C. Wise. "In two months I have sharpened 155 hand mowers, 6 power mowers and 1 trimmer. My machine has paid for itself and everything I take in now is all profit"—from Otis Zacharia.

Here's a business you can start in spare time, and begin to make a CASH PROFIT right away. The Foley handles up to 3 or 4 mowers per hour, and prices run $1.50 to $3.00 for hand mowers, $5.00 to $8.00 for power mowers.

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- Proven design—nationally advertised and sold for over 5 years

GIL-BILT 10-INCH TILTING ARBOR SAW

- 27x28 in. table, 13½ in. capacity in front of blade
- 10 in. blade cuts 3¼ in. deep, tilts full 45 degrees
- Floor model 34" high, table always stays level
- New Departure ball bearing arbor, ¾" precision shaft turned down for ⅝" bore blades, alum. housing, shipped ready to run
- Jackscrew and 4½ in. dia. handwheel lowers and raises blade
- Cast aluminum miter gauge and self-aligning rip fence guide

GIL-BILT Metal Parts Kit includes Plans, ball bearing arbor, miter gauge and bar, rip fence guide, dado insert, lock knobs, jack screw mechanism and handwheel, and all other metal parts (less blade).....**$21.95**
Same Kit with 10" Combination Blade....**$24.90**
Same Kit with 8" Combination Blade....**$23.90**

GIL-BILT BELT SANDER

- 84 sq. in. sanding surface. Over 4 times the effective area of a 10 in. disc sander.
- Belt operates in either vertical or horizontal position, does all sanding operations.
- Driver drum and pulley turn on sealed New Departure ball bearings; tension drum turns on Chrysler Oilite bronze bearings.
- Spindle and tension mechanisms of cast aluminum, completely machined and assembled.
- Belt travels 1800 ft. per min. Over a MILE of straight sanding action every three minutes. Saves more "elbow grease" than any other tool.

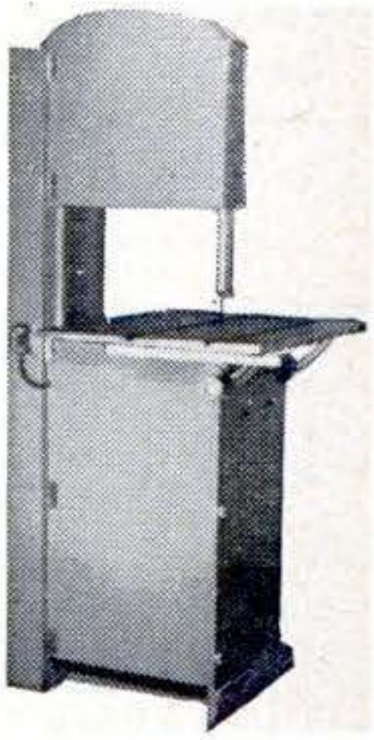
GIL-BILT Metal Parts Kit includes Plans, ball bearing spindle, 4 in. driver drum, 3 in. tension drum, tension mechanism, table tilt segments, rubber tires, cloth sanding belt, and all other metal parts **$16.95.**

GIL-BILT 12-INCH BAND SAW

- Cuts to center of 24 inch circle
- Handles stock up to 6 inch thick
- 18x18 inch table tilts 45 degrees
- Lower wheel and drive pulley runs on sealed New Departure Ball Bearings; Upper wheel runs on two ⅝" bore Oilite Bronze bearings.
  - Upper wheel tension and tilt mechanism of cast aluminum, completely assembled.
  - Upper and lower blade guides. Each has ball thrust bearing, self-lub bronze jaws
  - Rigid cast aluminum wheels fully machined ready-to-install. Heavy rubber tires.
  - Uses standard 78 inch blades up to ⅜ in. wide.
  - Fully enclosed mechanism for utmost safety.

GIL-BILT Metal Parts Kit includes Plans, rubber tires, aluminum wheels, ¼ in. blade, ball bearing spindle, tilt mechanism, blade guides, table tilt segments, and all other metal parts.....**$21.95**

GIL-BILT 18" BANDSAW



- Cuts to center of 36 inch circle
- Maximum height under top guide 12 inches
- 26x28 in. table tilts 45 degrees
- Floor model. Motor and all moving parts fully enclosed
- Heavy ¾" drive shaft. Oilite bronze bearings never need oiling
- Rigid cast aluminum wheels precision machined, 18⅜ in. dia. with rubber tires
- Upper and lower blade guides. Each has ball thrust bearing, self-lub bronze jaws
- Upper wheel tension mechanism of aluminum and steel, completely assembled

GIL-BILT Metal Parts Kit includes Plans, rubber tires, aluminum wheels, ¼ in. blade, drive shaft and bearings, tension mechanism, blade guides, table tilt segments, and all other metal parts **$34.95**

Return Kit in 10 days For Refund if Not Satisfied

(Prices include postage within 300 miles. Over 300 miles add 5% to above prices.)

Also available—Plans and Parts kit for 8" Tilt/table saw.

Order Plans at $1.00 each—Sent postpaid anywhere in the World or write for FREE descriptive catalog.

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The Mounties Become Mechanics

[Continued from page 262]

sled over the tundra of the Northwest Territories in 1951. Many remote Eskimo tribes cannot be reached even with aircraft because the hummocks of ice are unsafe for landings on skis. When an Eskimo woman named Mikaeyout was rumored to have slain her husband, a Mountie constable from the Pond Inlet detachment trekked 1,500 bitterly cold miles on snowshoes to arrest her. He camped in the open when the temperature dropped to 70° below.

Wings Team with Snowshoes

Assistant Commissioner Rivett-Carnac, a massive man of 50, contends that the airplane in the North should be mainly a one-way proposition if a trooper is to patrol his district efficiently. "You've got to know the trappers and the woodsmen and the natives personally or you will never really get to the bottom of the crimes and troubles in which they may be involved," he told me.

"When I was stationed at Aklavik on the Arctic Ocean," he continued, "I flew one way on patrol but I traveled by snowshoes and dog team in the other direction. I bunked with the isolated people of the wilderness and got to know them."

Autos Cover More Ground

I watched Assistant Commissioner Alan Thomas Belcher inspect the automobile fleet of K Division, which covers all of Alberta—an area nearly the size of Texas.

"It's not like when the cavalry column was lined up on frisky geldings and the band played *Maple Leaf Forever*," he said, half apologetically. "But we're a more effective organization because of automobiles. They may not have the dash and color and romance of horses, but they're many times more efficient in making the best use of our rather limited manpower."

Automobiles, airplanes and radio challenge the notion of the Mounties as a

[Continued on page 266]

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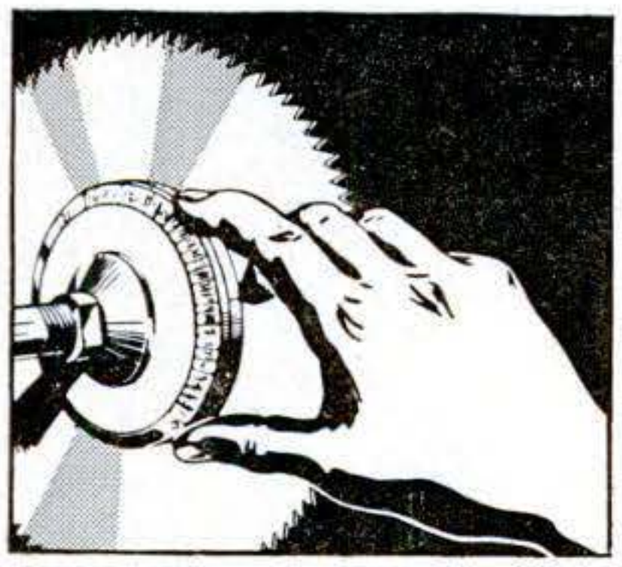
Warren DADO SAWING WASHERS



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CHROME-CLAD

MEZURALL

177

"My Mezurall with its adjustable hook gives me accurate inside measurements. It also measures odd shapes, as well as butt end and hook-over measurements. The jet-black markings are easy to read against the durable chrome white background which will not crack, chip, or peel. I can replace blades in a matter of seconds. You can get them in 6, 8, and 10 foot lengths."

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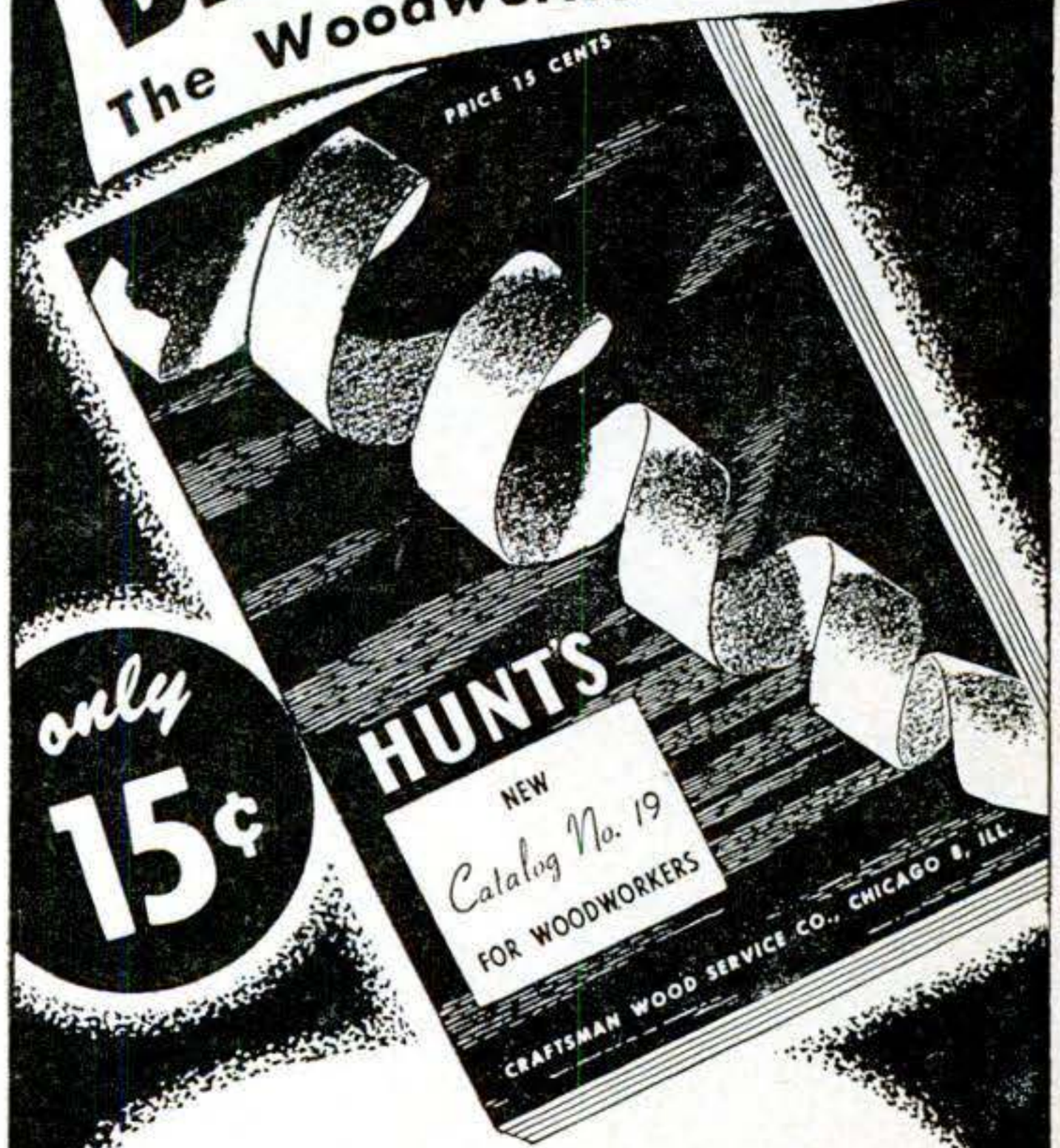

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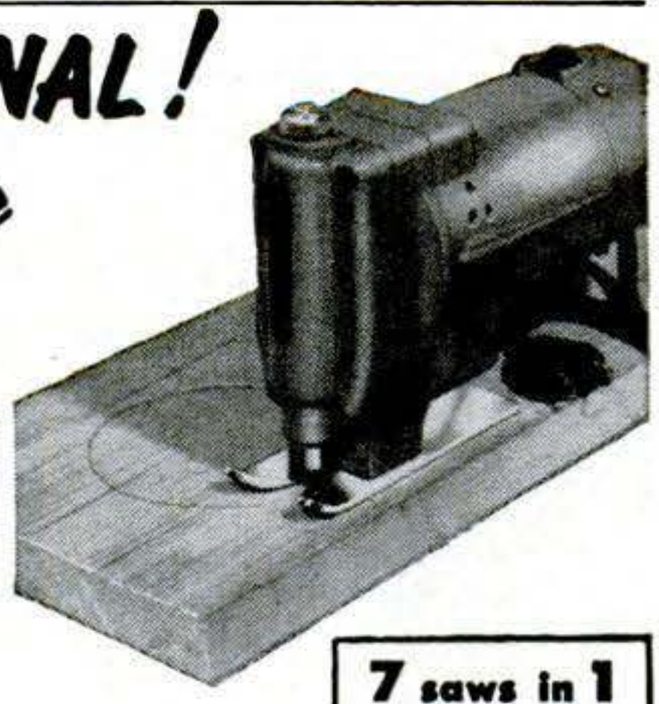
WHIZ SAW



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Whiz Saw #2 has greater capacity, cuts up to 2" thickness, $130.00. Whirl Saw, a 4½" circular blade, cuts up to 1¾" thickness, $49.00. If not available at your dealers, write to: The Forsberg Mfg. Co., Bridgeport, Conn. U.S.A.

WHIZ-SAW $5500
Table $18.95

7 saws in 1
RIP, CROSSCUT, KEYHOLE, COPING, SCROLL, BAND OR JIG

the ideal cutting tool for:
HOBBYISTS
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SIGN-MAKERS
MAINTENANCE MEN

All-metal Whiz-Saw table may be secured with screws to wood bench or held in vise.

ANOTHER Forsberg PRODUCT
Makers of the Famous Whale & Viking Tools

The Mounties Become Mechanics

[Continued from page 264]

frontier force, but a few concessions to drama remain. In the vicinity of the picturesque mountain resort of Banff, one of the most famous tourist spots in the world, the troopers on everyday duty still wear their scarlet tunics.

But whether in majestic red or humdrum brown, the Mounties rely upon scientific advance wherever they can—both in relentlessly pursuing the guilty and in parceling out mercy to the innocent.

The treasurer of a Canadian city was charged with embezzlement when a sudden flash fire burned all the money in his office. Officials suspected that he had cached the funds somewhere. The man had a good reputation and the Mounties believed the charge to be false.

Clear the Innocent

The crime-detection laboratory sifted through the ashes and created anew every piece of currency of large denomination that had been in the office at the time of the fire.

The man was acquitted.

The Mounties of 1953 are convinced that more criminal cases will be decided in modern laboratories than on the bleak and windswept expanse of the Barren Lands. The microscope is replacing the carbine, as the automobile has all but replaced the horse, among the tools of the vigilant troopers who in Canada's vast realm are assigned to "uphold the right." END

Papa's Pride and Joy

THE young mother stole to the door of the nursery and watched as her husband gazed down at their baby's crib. There was an expression of wonder and admiration on his face and she could hear him mutter: "I can't get over it! I just can't get over it!"

Deeply touched, she slipped to her mate's side and put her arms around him. "A penny for your thoughts, darling," she whispered.

Startled, he blurted: "Why for the life of me, I can't get over how I built that beautiful crib for only $10!"—*Lino-Lines.*

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The new "Evans White-Tape" has everything you'll find in tapes costing over $1.50—plus.

- snow-white blade with bold, legible, jet-black numerals and graduations. Graduated in 32nds for first 6 inches.
- sturdy die-cast case heavily chrome-plated, calibrated for quick reading inside and outside measurements.
- blade ½" wide made of finest high carbon steel—tempered—Bonderized—enamelled—baked.
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- every "Evans White-Tape" is unconditionally guaranteed.
- exclusive Evans automatic brake gives smoother push-pull action with absolutely no "creeping" of tape into case.
- underside is white, too. Mark with ordinary pencil, remove mark with flick of thumb.
- unheard-of low price*: 10-ft. $1.49; 8-ft. $1.19; 6-ft. 98¢. Prices higher in far west and Canada.

Sold only through retailers.

Evans & CO Elizabeth, N. J., Montreal, Que. ® 7429

Makers of Evans 6-ft. Folding Rule and "Folding Yardstick"

ONE-MAN SAWMILL LOW AS... $50.00 DOWN

Take BELSAW Portable Sawmill right to the trees—turn out valuable lumber for local yards—do "custom sawing" for neighbors. BELSAW lasts a lifetime. No crew needed. Power with old auto engine. Beginners get excellent results. Send postcard for FREE BOOK, "How To Make Lumber."

FREE BOOK

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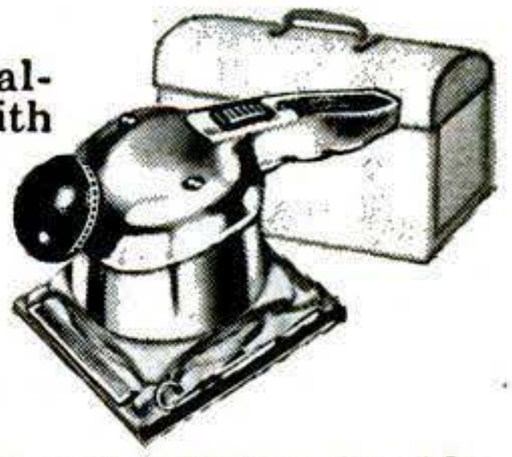

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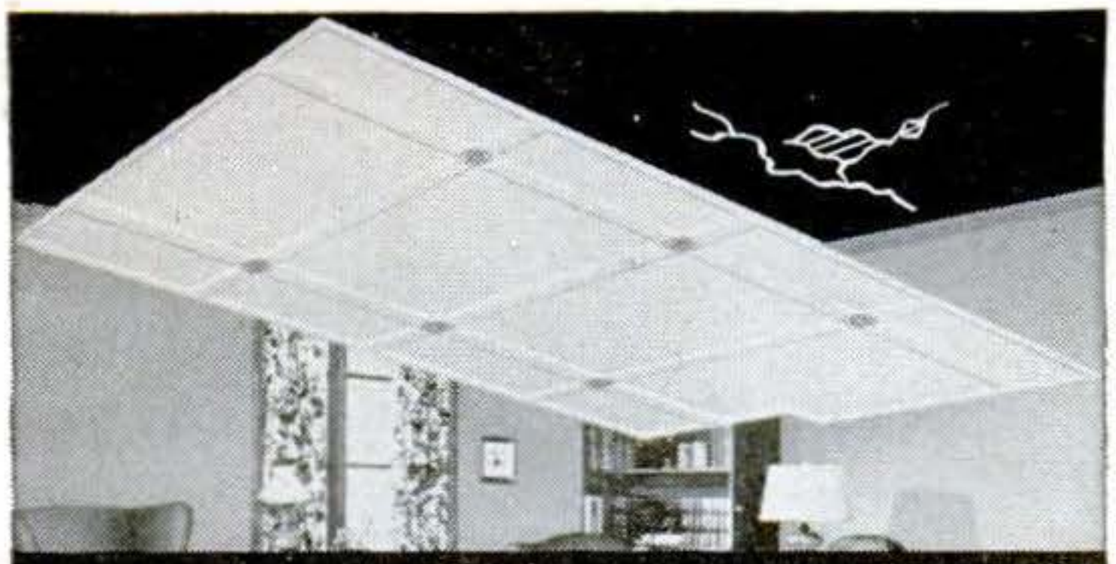

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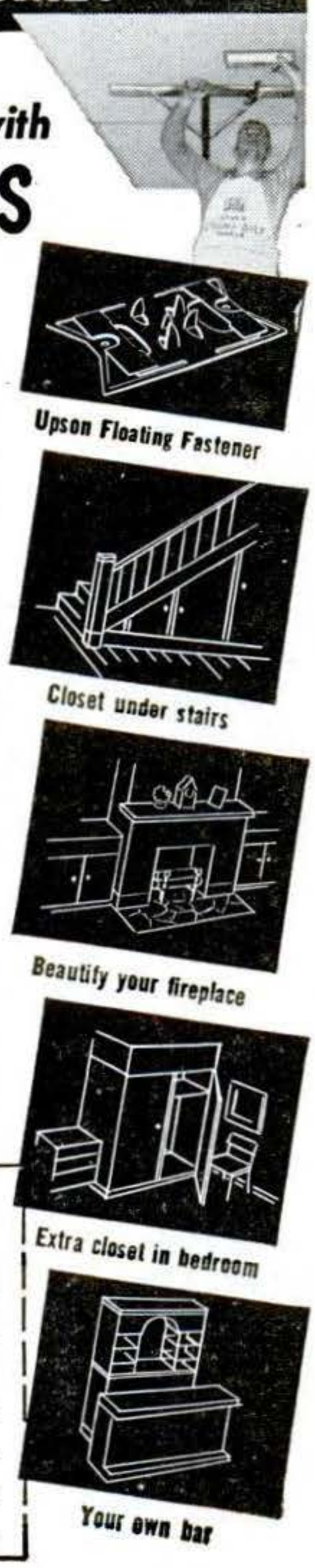

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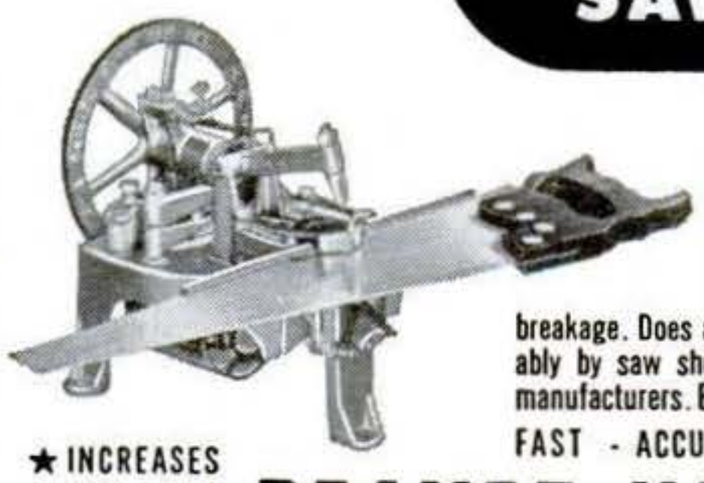

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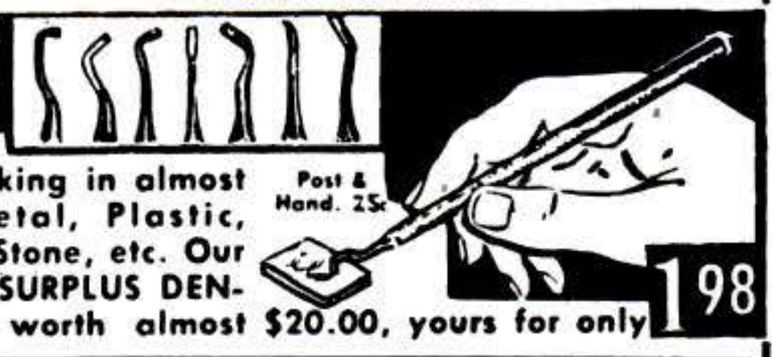

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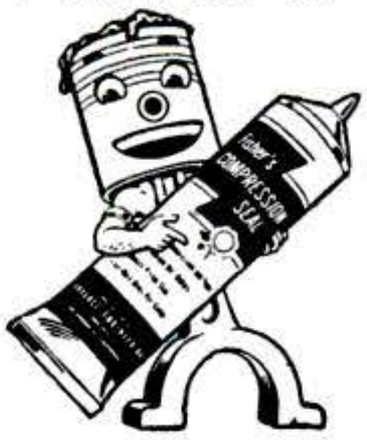

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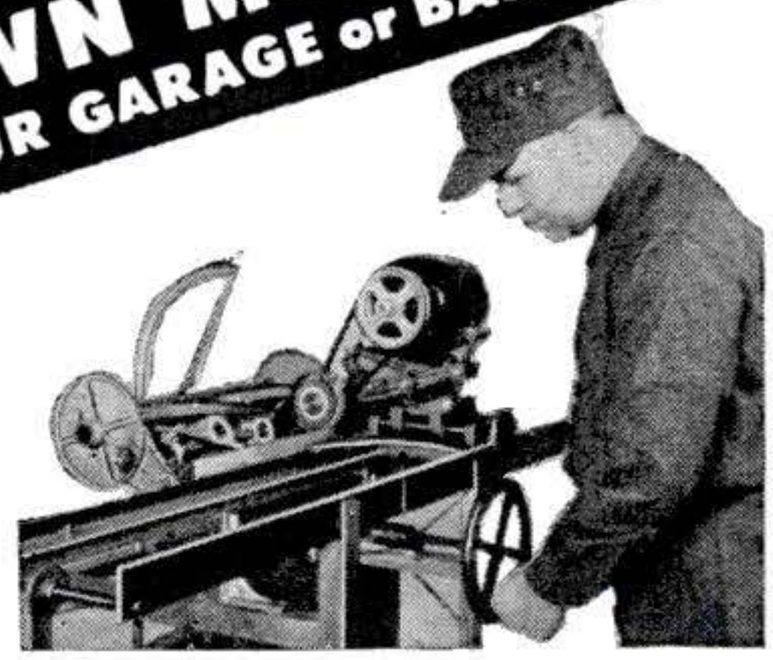

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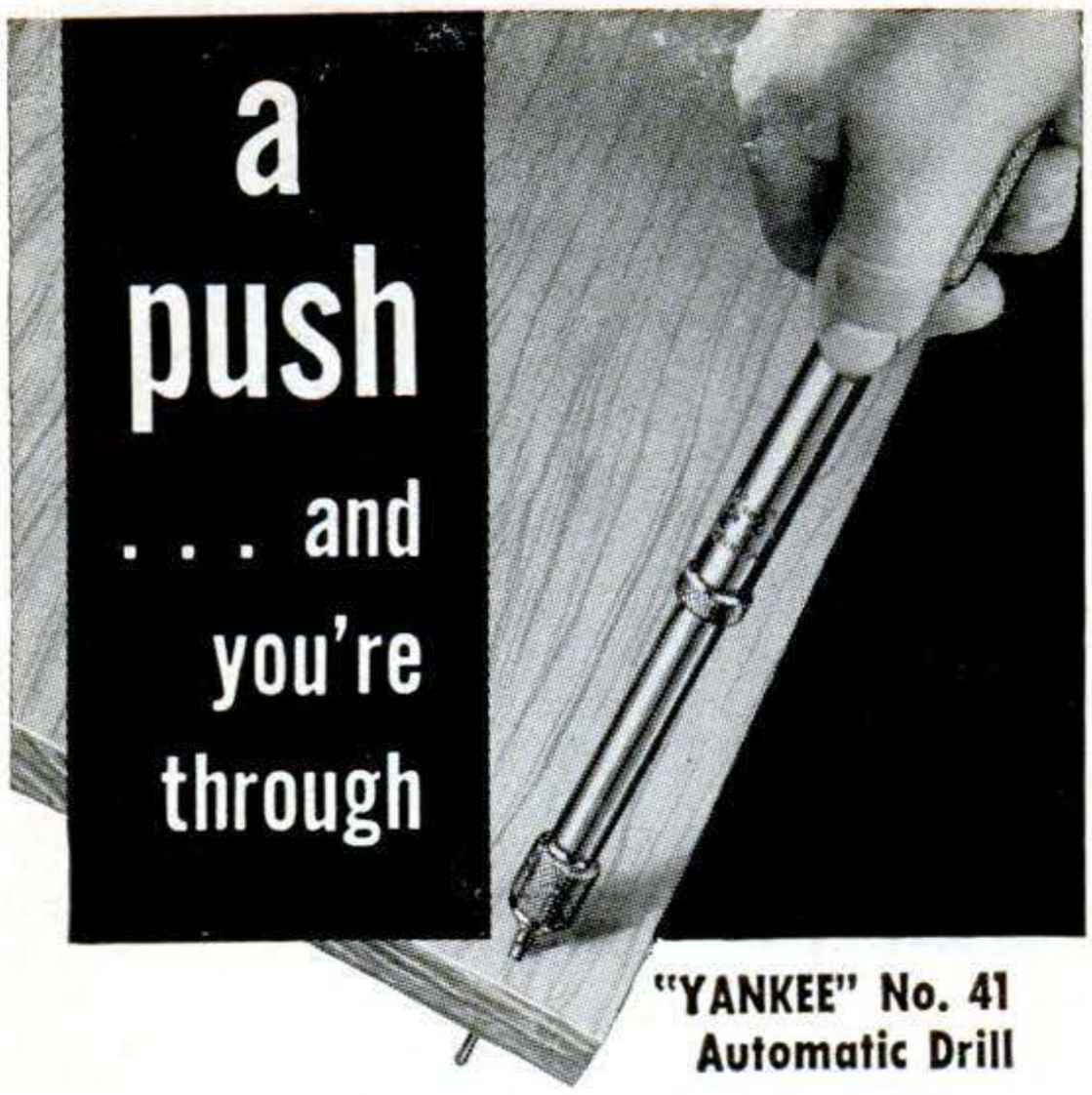

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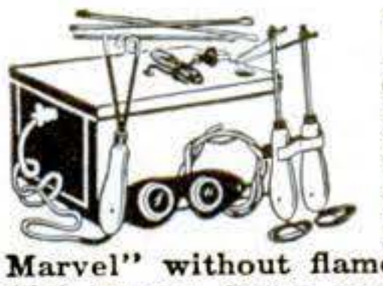

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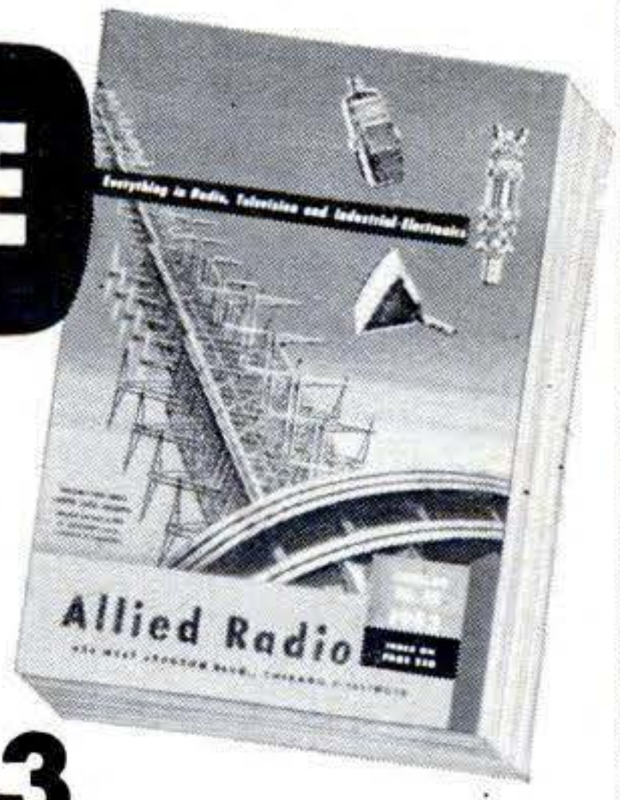

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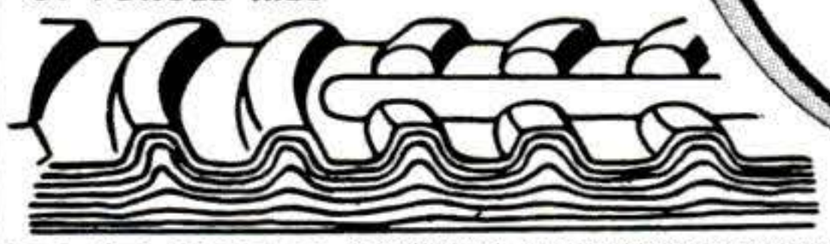

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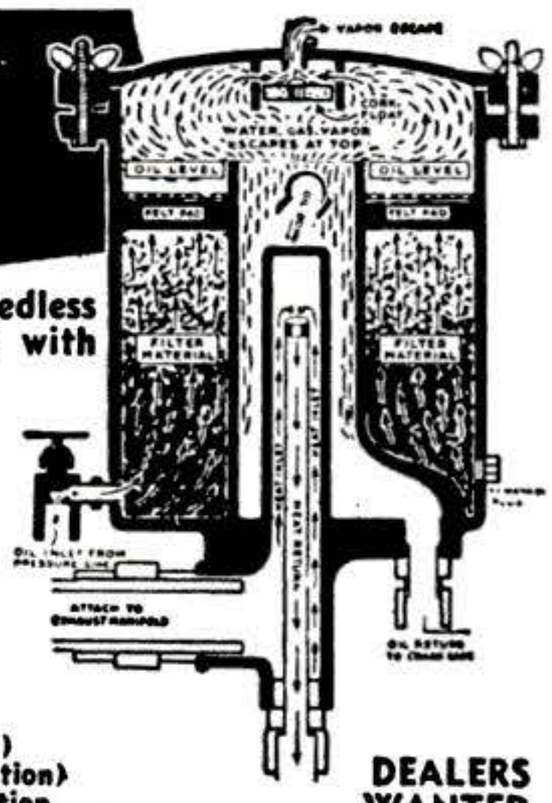

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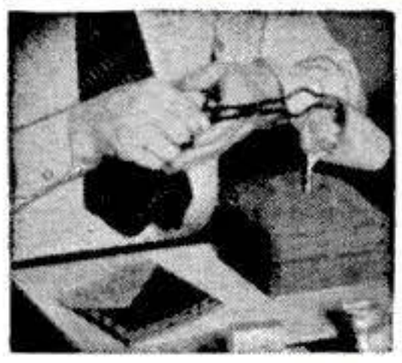

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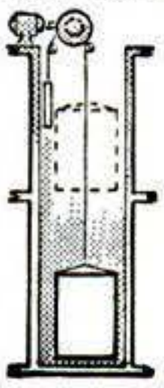
Heavy duty, 10-1 ratio, double drum model with jaw-type clutch, wgt. 280 lbs.....**$49.95**
CABLE, ¼" preformed stainless steel aircraft, 100 ft. or less.....**17c/ft.**
Over 100 ft.....**15c/ft.**



BUILD YOUR OWN INCLINE OR DUMB WAITER ELEVATOR

Get all the convenience of a dumb waiter elevator for store, shop, restaurant and home—or the convenience of an incline elevator on steep lake shores, hills, ravines, etc. at lowest cost. We furnish complete parts. Steel Car—Guide Rails—Worm Gear—Limit Switches—Electrical Control—Steel Cable. SEND 25c for completely diagrammed instructions with list of parts, kits and prices.

ALARM HORNS • SIRENS

Motor driven (not a vibrator). Heavy duty with great power and long life. Adjustable for high, medium or low tone. 110 v. AC current. Weather proof. For alarm or signal horn on boats, school yards, factories, air raid siren, etc. Lists at $47. Our price NEW **$24.95**

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Top performance for forced draft, ventilating, exhausting, cooling and drying, 110v. AC.
75 cu. ft. per min.....**$10.95**
150 cu. ft. per min..... **13.95**
300 cu. ft. per min..... **17.95**
500 cu. ft. per min..... **36.00**

CLUTCHES

For Motor scooters, motor bikes, etc. Centrifugal action enables electric motors or small gas engines to handle heavy starting loads. 3" A belt pulley. NEW. ⅝" bore **$9.95;** ¾" bore **$10.95;** 1" bore **$11.95**

CENTRIFUGAL Ball Throw-out CLUTCH. A or B belt pulley. ¾" bore **$9.00;** 1" bore **$11.00**

FRICTION DISC CLUTCH

Twin disc throw-out type. Ideal for power link with gas engines and electric motors from ¾ to 15 hp. 1-7/16" shaft bore—can be bushed to suit. Overall length 4", 5½" plate with 6 mounting holes. Lists at $44. Used like new **$15.95**

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Heat water faster, easier with this immersion unit. 115- v. AC—1250 watt Westinghouse or Chromolox element. Manual unit, $42 value, $6.95; thermostatic Fenwall control $3.95. Element with Fenwall thermostat, $8.95. 10 gal. steel tanks 12 x 21"—$9.95; 8 x 42"—$11.95. 18' cord ≠12/2 or 3 conductor with plug **$2.25**

RUBBER HOSE

Long wearing GOODRICH 2 ply 2" I.D., 25 ft. lengths worth $25. Only **$4.95;** 3 lengths for **$12.00.**

SAVE OVER 50%

ON THESE BRAND NEW WAR SURPLUS POWER UNITS

BE PREPARED for any emergency!

300 WATT 110-220 volt AC, 60 cycle light plant powered by 1 HP gas engine, direct drive, mounted base, wgt. 40 lbs. Ideal for campers, P.A. systems, house trailers, etc. Equipped with handle for easy carrying.....**$99.00**

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To make 110-220 add $40, for transformer.

2500-3000 WATT 110 volt AC, 60 cycle, Leland generator—runs at slow speed (1800 r.p.m.) for longer life, 8.25 HP Briggs & Stratton gas engine. You can rely on this plant for all average home needs—freezer, stoker, pump, hot plate, radio, etc. —and overloads from starting motors. Reconditioned and fully guaranteed.....**$295.00.**
NEW **$345.00**

Plants same as above, built in 1951, with tools and spare parts. Lists at $790. Our price **$426.** To make 110-220 add $48 for transformer.

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10,000 WATT 110-220 v. AC. Reconditioned.... **$1195.** NEW .....**$1495.**

25,000 WATT 220 v. AC, 3 phase or 110-220 v. single phase. Reconditioned **$1995.** New **$2495.**

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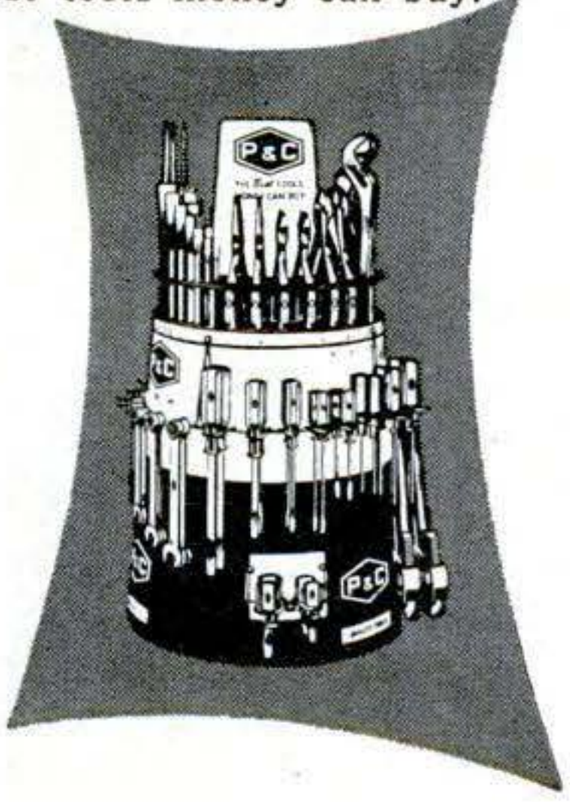

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PUROLATOR OIL FILTERS

The perfect filter to keep motor oil or hyd. fluid clean at all times. Permanent type. No. G159J-32. Protect your pump, engine, midget racer or boat with this unit. To clean element, just turn handle. Inlet and outlet ports take pipe or straight threads up to 3/8" male pipe. Accommodates 16 GPM at 30 PSI. Mtg. brackets. Wt. 4 lbs. A $15 value, **NEW** to you, with 2 **FREE** male reducer connectors for only **$3.85.**

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Terrific for mechanics or hobbyists, for heating, burning, soldering or brazing. Compact, versatile torch for electricians, plumbers, painters, auto mechanics, dental technicians, jewelers, neon glass formers, plastic workers and radio repair men. Burns for 10 continuous hours. Replaceable fuel cylinder. No moving parts to get out of order. Burns in any position with non-varying flame of approx. temp. of 3660°. No hose connections to get in way. Always ready for use! 2½" dia. 10" long. Absolutely safe, ICC approved. Wt. 2 lbs. **NEW.** An amazing value **$6.95.** Extra fuel cylinders **$1.95.**

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ULTRA PRECISION—Imported for the really critical mechanic who must have the best. Recommended and used by experimental and research machinists at Lockheed, Douglas, Bendix, GM, RCA, GE. ALL NEW and at **low, low** prices . . . but quantity is limited! Model 51-Genuine Helios. Hardened lapped precision surfaces. 1/1000" and 1/10 mm graduations. Has handy slide roll and thumb lock. Quick accurate depth. A $35 value, it's yours complete with leather carrying case for just **$6.95.**
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Chrome plated, precision engineered, carefully tooled to give long life. All new 0-1" capacity—$2.25 ea 1-2" capacity—$3.50.

HYDRAULIC HAND PUMP

Handle operated. Operating pressure 1500 PSI. Telescope extension handle for greater leverage. **NEW.** A $75 value. **Now only $9.95.**

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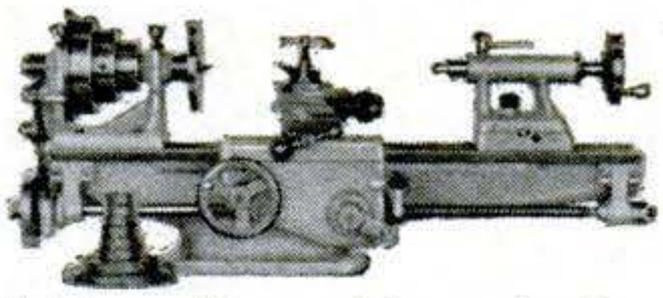
JUST OUT—NEW CONVERTIBLE!
Operate it for 75c per week. Amazing performance. Surprising comfort. All steel construction. Ready to run or assemble it yourself with our bolt together parts. Rider Agents wanted, earn your car Free. Send 25c for detailed literature or $1 (refunded first order) for actual assembly book and service manual filled with photos, drawings, specifications, etc.
MIDGET MOTORS MFG. CO., ATHENS, OHIO



BUILD YOUR OWN MACHINE TOOLS

CASTINGS-DRAWINGS

Catalog with complete construction drawings of this 8 inch Modelmaker screw cutting lathe with milling, grinding and hand shaper attachments, 25 cents postpaid, or send one dollar for drawings of three lathes, three milling machines and six inch crank shaper. Refund on castings order.

POOTATUCK CORPORATION, 104 Sammis Pl., Stratford, Conn.

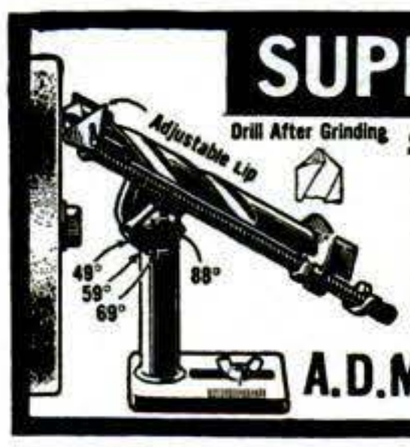
NEW . . LOW PRICE Alcohol Blow Torch

One filling throws an 1800° flame a full hour. No priming or pumping, just fill with denatured alcohol and light. Nickel plated on brass. Safe and convenient. Complete instructions included. **$2.50 ppd.**

GLUE INJECTOR COMPLETE WITH DRILL

Drill in handle makes a tiny hole to heart of joint—plunger forces glue through hollow tip and hole into and around joint under great pressure. Mends furniture and toys quickly without disassembly. Model Worker's dream. Satisfaction guaranteed. Sorry, no COD's. **ppd. $1.65**
Artcraft Products Co., Box 876S, Cleveland 22, Ohio

SUPER DRILL GRINDER



Sharpens round shank drills from 3/32" to ½" in diameter, up to 6" long. Grinds old drills like new in 4 different point angles, using hand or power grinding wheels. Money-back guarantee, only **$2.95**

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WONDER-PASTE

Apply with a paint brush. Strip with a putty knife.

Stays put and workable, even on upright surfaces. Penetrates toughest finishes. Over 3 million cans sold. It must be good . . . At paint and hardware stores.

Write for leaflet and advice on removing problems.

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GENUINE ALNICO—NEVER WEAKENS

AMAZING, PERMANENT MAGNETS—WILL NOT WEAKEN! NON-ELECTRIC
Retrieve guns, tackle, tools and other steel items from lake, river, plating tanks, drains or other hard-to-reach spots. Recover drills, taps, etc. from sweepings. Clear alley of harmful tacks, nails. Many other uses. Pays for itself quickly. GUARANTEED. Try any magnet one week. Money refunded if you are not well pleased.
No. S-725 (Weighs 54 oz.) Has pull of 225 lbs. on steel block **$15.00**
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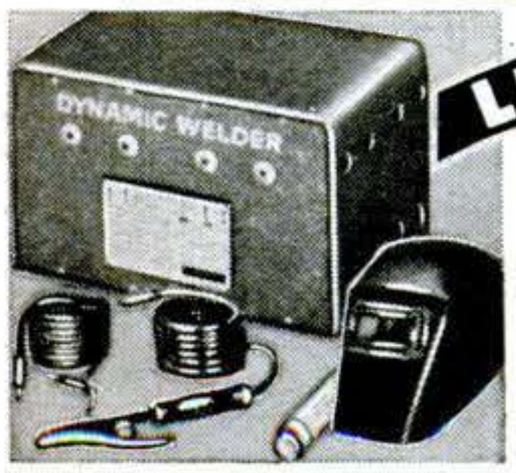
No. S- 30 Hobbyist assortment of six small magnets. . . . . **$ 1.50**
Send Money Order or check. We pay postage. No C.O.D.'s.
MIAMI MAGNET COMPANY, 3240 N.W. 27th Ave., Miami 42, Fla.



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Complete Outfit and How - To - Do - It. Everything Needed to Get in Business.

FASCINATING HOBBY...PROFITABLE BUSINESS
This is the time to cash in on big profits to be made doing welding for yourself or others, making valuable items of metal to use or sell. No experience or expensive equipment needed to get started in a profitable business of your own, full or spare time. Write for full details. **FREE**

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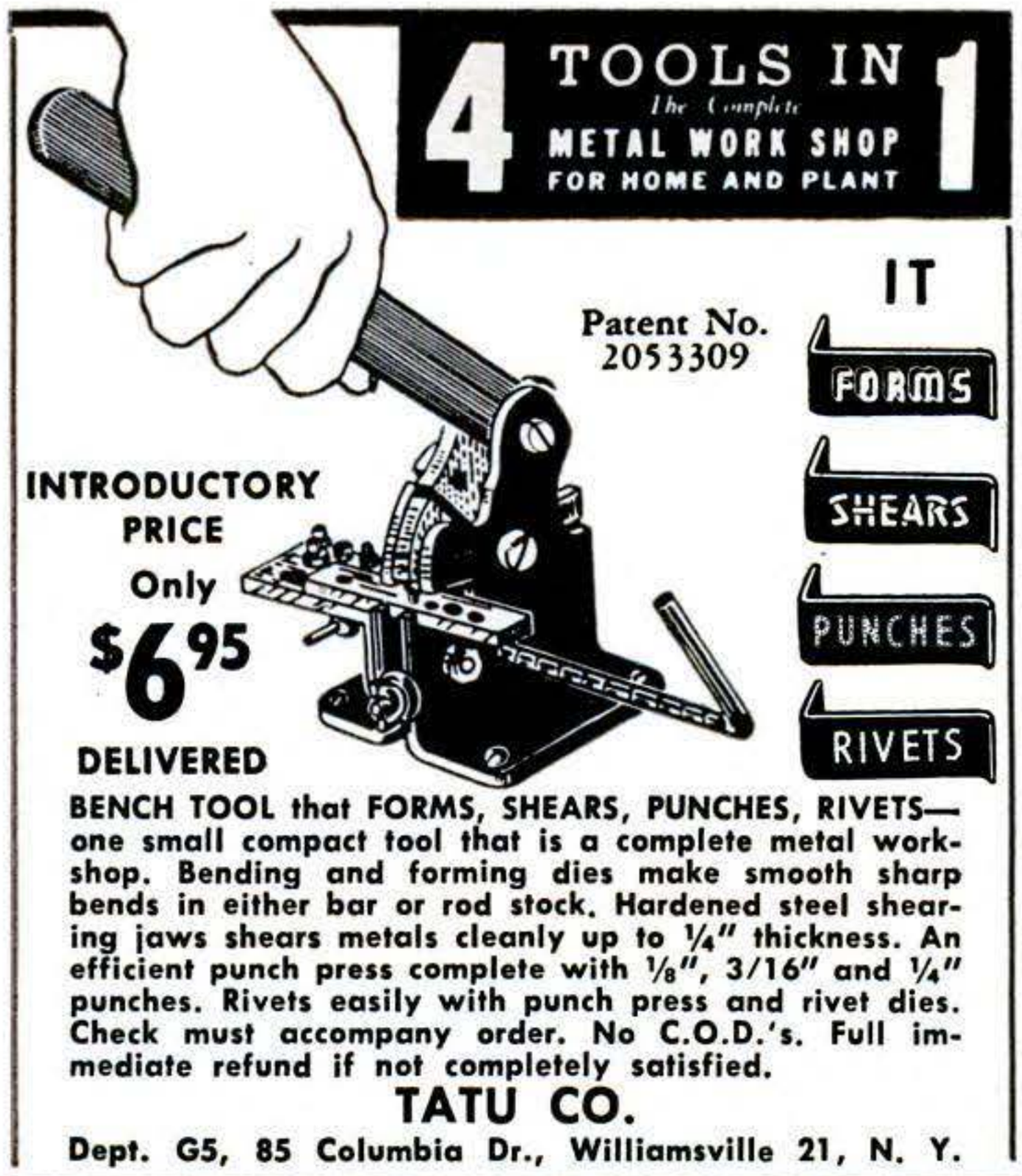

BENCH TOOL that FORMS, SHEARS, PUNCHES, RIVETS—one small compact tool that is a complete metal workshop. Bending and forming dies make smooth sharp bends in either bar or rod stock. Hardened steel shearing jaws shears metals cleanly up to 1/4" thickness. An efficient punch press complete with 1/8", 3/16" and 1/4" punches. Rivets easily with punch press and rivet dies. Check must accompany order. No C.O.D.'s. Full immediate refund if not completely satisfied.

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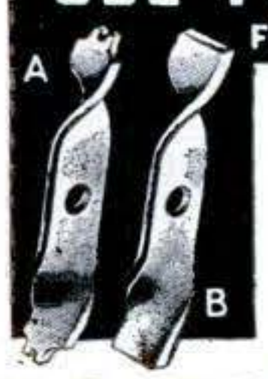
USE YOUR BENCH SAW

FOR JOINTING & CUTTING MOULDINGS



With our six inch tool steel cutters make mouldings, casings, drop-leaf tables, grooves beading and jointing. Moulding cutters, A 1 in. wide $1.75. 1½ in. $2.25. Jointing cutters, B 1 in. $1.75. 1½ in. $2.25. E 1 in. for drop-leaf tables, $1.75. E 1½ in. Makes ¾ in. cove & Quarter. $2.25. Postpaid. Guaranteed. State size hole. List & Folder free.

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It's New! It's Different! Get world's largest Auto Accessory & Parts Catalog and save money. Over 50,000 items, including Hollywood Accessories, Hi-Speed Equipment, Rebuilt Engines, all parts & accessories for all cars & trucks. We have that Hard-To-Get part! Jam packed with bargains. Completely illustrated. (100 pages) Send 25c (refundable).

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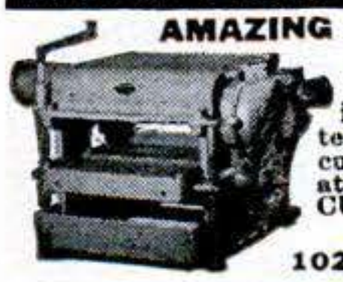
DO MORE PLANING JOBS WITH LOW-COST BELSAW $215.00



AMAZING 12¼-IN. PLANER Does All Ordinary Planing Mill Jobs. Provides attachments for Jointing, Rabbeting, Tongue, Groove, Matching. 12¼ x 6-in. capacity, 3-knife solid round all-steel cutterhead. Power feeds at 24 feet per minute, 42 cuts per inch. Provides for full line of accessory attachments—Grind and Joint knives IN THE CUTTERHEAD WITHOUT REMOVING.

FREE BOOK

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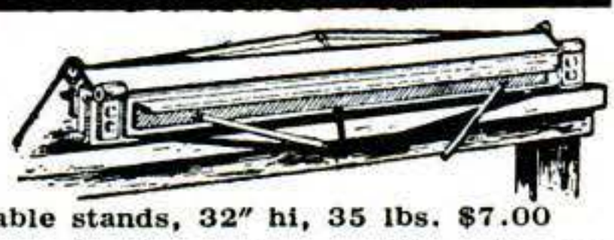
1022 Field Bldg., 315 Westport Rd., Kansas City 11, Mo.

SHEET METAL BRAKES



Angles, flanges, Pittsburgh locks. 24 G. steel, heavier aluminum. Cam locking, mount on bench, truck or floor stand. Truss braced steel. Express collect. 30", 65 lbs. $28.50, 36", 75 lbs. $33.00, 48", 100 lbs. $48.00. Portable stands, 32" hi, 35 lbs. $7.00

IRON BENDER forms hooks, angles, eyelets, etc. Capacity ¼x2", 5/16x1½", 10 parts, all steel. Express Collect..... **$9.50**

24" CURVE FORMER. Forms straight and tapering pipes 2" to 2 ft. dia. 16 Gauge. Express collect. **$9.50**

(Immediate delivery. Order direct, cash or C.O.D., or send for folder.)

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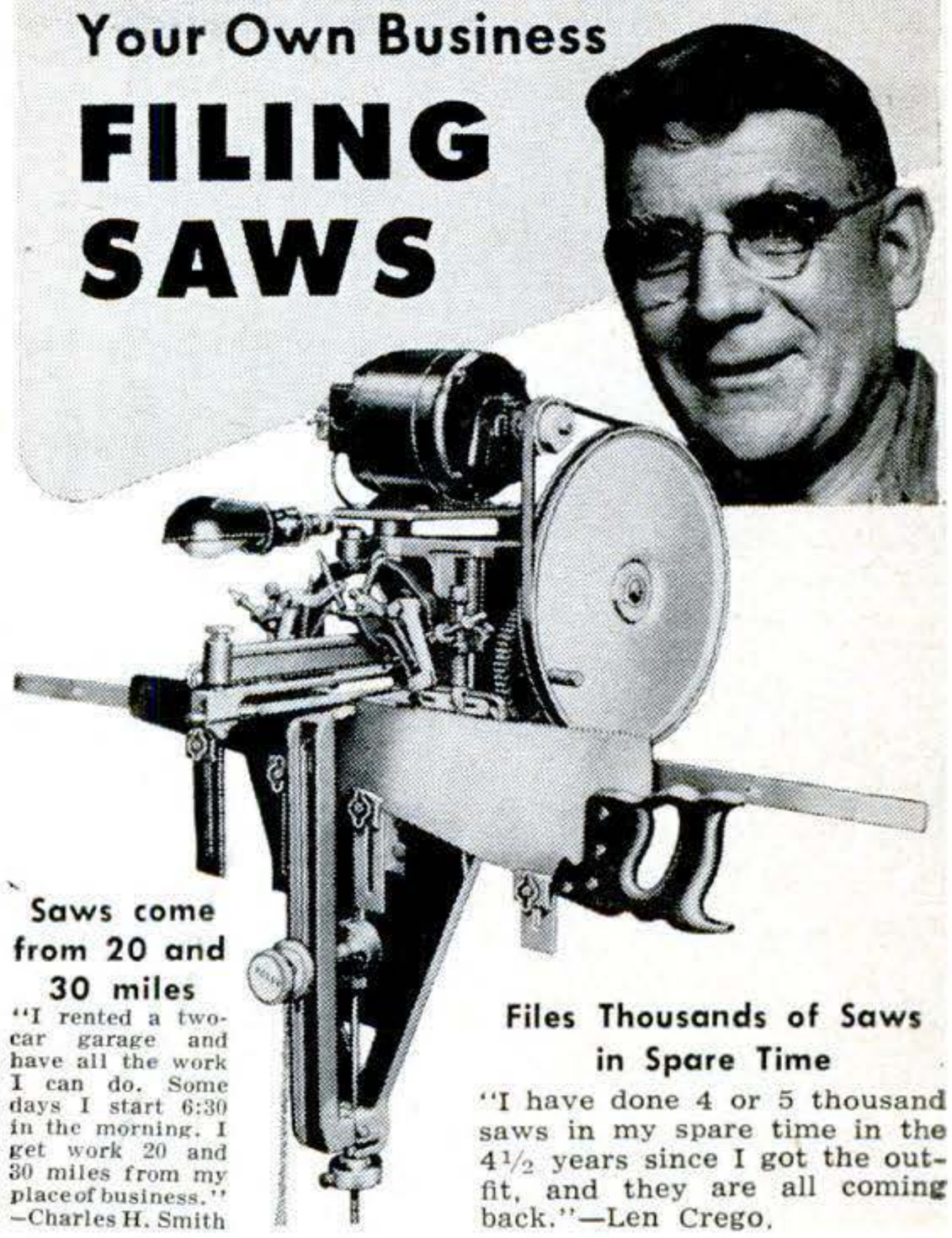
FREE PLAN

Tells How to Start Your Own Business

FILING SAWS



Saws come from 20 and 30 miles

"I rented a two-car garage and have all the work I can do. Some days I start 6:30 in the morning. I get work 20 and 30 miles from my place of business."—Charles H. Smith

Files Thousands of Saws in Spare Time

"I have done 4 or 5 thousand saws in my spare time in the 4½ years since I got the outfit, and they are all coming back."—Len Crego.

FOLEY FILED SAWS BRING NEW CUSTOMERS

Here is a steady repeat CASH business you can start in your own basement or garage in your spare time. Every saw you sharpen with the machine accuracy of the Foley Saw Filer is an ad that brings more customers. S. M. Hollingshead wrote to us: "I am doing very well with my Foley Filer, and I am glad I invested in your machinery. It is very satisfactory and works very well in the small community in which I live."

You can file all hand saws, also band and crosscut circular saws on the Foley Saw Filer. The adjustments are simple—there is no eyestrain—and you can start right away to turn out perfect cutting saws. "The first saw I sharpened with my Foley Saw Filer came out 100%. I think it is a marvel of perfection."—writes Clarence E. Parsons.

"MONEY MAKING FACTS" explains how you can get business from hardware stores, home owners, farmers, carpenters, schools, mills, factories, etc. Just think—with a modest investment, no overhead, no stock of goods to carry, you can start right in on a cash business that will help pay the rent, buy groceries, or a new car. Get the facts—send coupon today for this practical, money-making plan. No salesman will call.

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Send me free book **"MONEY MAKING FACTS"**

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$10.00 VALUE — ONLY

Here's what you get! Mounted Stones on 1/8" mandrel, Drum Sander, Sanding Sleeves for sander, Rotary Cutters, Wire Scratch Brush, Bristle Brushes, Circular Saw, Buffing Wheel, Grinding Wheel, Rubber Polishing Wheel, Cut-off Wheels, Rubber Cylinder, Mandrels to fit above tool, asst'd Sanding Discs, Sharpening Stone, etc.

18 ROTARY CUTTERS $13.50 Value illustrated 1/2 actual size $5.85 Post-paid

Assorted sizes cutter on 1/8" or 3/32" shank. Will fit all hand grinders. Ideal for cutting wood, metal, or plastic. Brand new.

12 MINIATURE CUTTERS $1.00 Post-paid

FOR CUTTING WOOD, PLASTIC, or METAL. Actual size. Asst. shapes on 3/32" shank. For die makers, home workshop, etc.

7 HIGH SPEED TWIST DRILLS $1.00 Post-paid

15 DRILLS FOR ONLY $2.00! Order Today! 7 Popular Sizes—up to 1/4". Brand new, ideal for home or shop use. Fits all standard chucks.

5 DRILLS FROM 1/4" to 1/2" DIAMETER—$1.95

SURPRISE VALUE 100 Pieces FOR ELECTRIC GRINDERS $1.00 Post-paid

Grinding Wheels, Cut-off Wheels, Sanding Discs, Mounted Stones, Sharpening and Honing Stones, Rotar Cutting Burs, Abrasive Cartridges, Mandrels, and many other items.

Free!

For a limited time only, and while supply lasts, we will give the items below absolutely FREE with every order for $6.00 or more. Value of these FREE items is $3.25.

3 Grinding Wheels 1 1/2" to 3 1/2"
1 Cut-Off Wheel 3" Dia.
2 Buffing Wheels 3" & 4" Dia.
2 Felt Pol. Cylinders

Every item in this ad, including the FREE items, is BRAND NEW FINEST QUALITY merchandise, sold with the Schupack guarantee of satisfaction. To get this FREE Offer clip this ad to order. All mdse. postpaid in U.S.A.

1953 Illustrated Catalog 10c

FLEXIBLE SHAFT — ONLY $4.95 Post-paid

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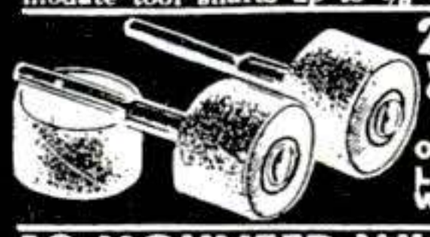

2 DRUM SANDERS With 12 Bands in Assorted Grits. 1/2" dia. x 1" long on 1/8" arbor with 12 bands $1.50 Post-paid

ONE DRUM, 1" DIA. x 1" LONG ON 1/8" ARBOR WITH 6 EXTRA SLEEVES $1.00 Post-paid

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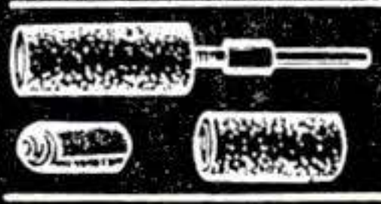
For grinding on plastic, wood soft and hard metals. Regular $8.40 List Val. 12 wheels on 1/4" Mandrel $3.60

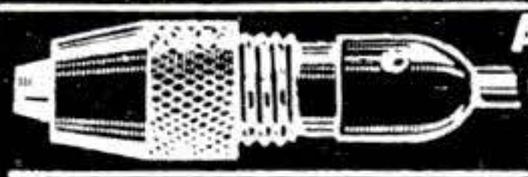
18 MOUNTED POINTS ON 3/32" MANDREL $2.50

18 GRINDING WHEELS and rubber polishing wheels, up to 1" dia. For grinding & polishing metals, plastic, wood. With one 3/32" mandrel. $1.00 Post-paid

10 CUT-OFF WHEELS 1 1/2" DIA. WITH 1/8" MANDREL $1.00



20 ABRASIVE ROLLS, cloth, and 1/8" mandrel for grinding, sanding, deburring metal, plastic, wood or rubber. ONLY.... $1.00 Post-paid



ADAPTER CHUCK With 2 interchangeable collets, opening from 3/32" to 0, on 1/8" mandrel. Price each only $1.50 Post-paid

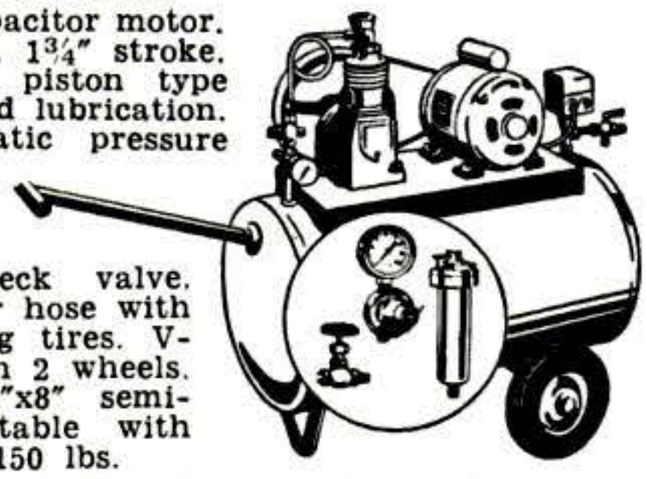
2 CIRCULAR SAWS ON 2 MANDRELS — ALL AT ONE LOW PRICE $1.50 Post-paid

1" diameter saws on 1/8" Mandrels. For cutting wood, plastic, or soft metals. Order at once! Send Check or Money Order.

SCHUPACK SUPPLY CO., 7331 COTTAGE GROVE AVE., DEPT. PS-2, CHICAGO 19, ILL. SEND CHECKS OR M. O. NO COD'S PLEASE

AUTOMATIC COMPRESSOR UNIT

WITH 22 GALLON TANK



1/3 H.P. heavy duty capacitor motor. 110 volt A.C., 2" bore, 1 3/4" stroke. 60 cycle. 2x1 3/4 inch piston type compressor, splash feed lubrication. 14"x32" tank, automatic pressure switch. CFM 2.8 at 100 lb. pressure, or 150 lbs. pressure for intermittent duty. Check valve, safety valve, 20 ft. air hose with air chuck for inflating tires. V-belt drive. Mounted on 2 wheels, ball bearing, with 2"x8" semi-pneumatic tires. Portable with handle. Shipping wt. 150 lbs.

With 1/3 h.p. motor Regular Price $175 **$98.50**

With 1 1/2 h.p. gas engine **$124.50**

Regulator, gauge and filter included at no extra cost

WELLWORTH AIR COMPRESSORS

Aluminum piston, stainless steel valves, 3 piston rings, bronze bearings, splash lubrication. Intake muffler, V belt cast iron fan cooling flywheel.

MODEL W800 COMPRESSOR

2"x1 3/4" 2.8 c.f.m. Operates with 1/4 HP or 1/3 HP motor up to 150 lbs. Weight 20 lbs. Special price.... **$20.50**

MODEL W200 COMPRESSOR

2 1/2"x2". 2.55 to 4.80 c.f.m. up to 150 lb. pressure. Operates with 1/3-1/2-3/4 HP motor. Reg. price $36.50. Special price .... **$27.95** Wt. 24 lbs.

MODEL W7 COMPRESSOR

2 cylinder 2 1/2"x2". 5.10 to 8.50 c.f.m. up to 150 lb. pressure. Operates with 1/2-3/4-1-1 1/2 HP motor. Reg. price $67.50. Special price ... **$54.50** Wt. 45 lbs.

PRICES F.O.B. CHICAGO. MONEY BACK GUARANTEE. SEND CHECK OR MONEY ORDER TODAY. PROMPT SHIPMENT.

WRITE FOR FREE CATALOG of bargains in light plants, generators, blowers, gas engines, etc.

WELLWORTH TRADING CO.

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BARRON *Drill Press* TOOLS

ROTARY PLANER

Planes • Rabbets
Tenons • Panels
Routs • Bevels

Only $7.50 COMPLETE

FOR WORKSHOP AND INDUSTRIAL USES...

● Over 40 precision built woodworking tools and accessories . . . Hi-Speed Router Bits—Rotary Surface Sanders & Drum Sanders—Safety Shaper Cutters—Dovetail Cutters—Large Auxiliary Metal Tables—All Metal Shaper Fences — Spindle Adapters — Handy Bench Vises. Many other items indispensable for accurate, useful, versatile workshop use. Every tool sold on complete satisfaction or your money back. See your Barron Dealer. Ask for special folder — "24 Extra Uses for Your Drill Press."

FREE Workshop Guide & Catalog

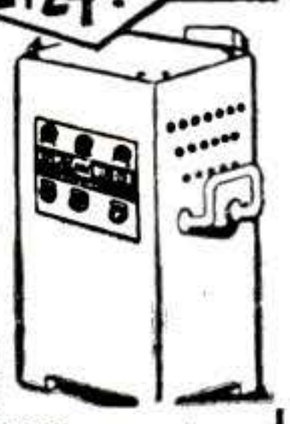
BARRON TOOL CO. INC.
366 Architects Bldg., Detroit 1, Mich.

ARC WELDING FOR PROFIT OR PLEASURE

60 LBS. OF READY MADE PARTS Only $24.95

BUILD YOUR OWN HEAVY DUTY WELDER

SAVE BUY ONLY NECESSARY PARTS



All necessary parts Ready-Made and easy to assemble. You can do all around welding on steel, cast iron and other metals after only a few hours practice. Illustrated instruction manual included. Sold on 30 Day Money-Back Guarantee! Free plans for building case.

FREE: Write today for fully illustrated Pamphlet S-1

ATOMIC ARC WELDER CO.
1039 So. 19th St., OMAHA, NEBR.

Gives 100% penetration. Welds are stronger than original metal.

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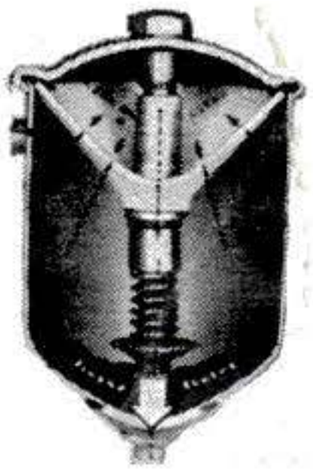
Guided Missile Filter CAN NOW BE USED IN YOUR CAR!

STOP THROWING MONEY AWAY!

GOVT. APPROVED OIL FILTER ELEMENT

NEVER NEEDS REPLACING! FULL 10 YEAR GUARANTEE!



The sensational "LIFETIME" oil filter forces all your oil through a porous bronze filter element which never wears out. It filters out dirt particles as small as 39/millionths of an inch as soon as your engine starts and allows no oil loss or bypass regardless of engine temperature. It saves the quart of oil soaked up by ordinary filter elements and does not absorb valuable, protective oil additives. "LIFETIME" pays for itself over and over by saving oil, engine repair, and ending the expense of stock filter element replacement. Fits all cars and light trucks. To clean, just rinse the bronze cartridge in gasoline.

Complete filter assembly (give make of car) **$12.95**

Permanent Element only (To fit in your present filter case).... **$6.95**

(Give make and model of car and present filter.)

(Above prices postpaid or send $1.00 deposit, balance C.O.D.)

Skidmaster

AUTO STABILIZER

CAN SAVE YOUR LIFE!

- **CONTROLS SKIDDING**
- **SAVES TIRES**

SKIDMASTER prevents death-dealing, bad weather skids by automatically balancing car weight. Professional racers proved that SKIDMASTER'S stabilizing action gives your car constant control—**even against blowouts.** Maintain and increase your traction . . . reduce sway & vibration with SKIDMASTER.

HOW SKIDMASTER WORKS . . . The moment your car moves, and especially when it skids or swerves sharply, SKIDMASTER sets up a counter force. This force, immediately overcoming the skidding momentum, is set up by the 43 lb. internal counterbalancing weight. Easily attached (out of sight) under rear bumper or in trunk of *any car.* **COMPLETE UNIT PPD. ONLY** **$39.95**

(Or send $10 deposit, balance C.O.D.)

SAVE GAS

WITH A FUEL PRESSURE REGULATOR!

STOP: • **Power Loss** • **Flooding** • **Fuel Waste** • **Stalling**

MANY USERS CLAIM UP TO 25% BETTER MILEAGE as this revolutionary new accessory stops gas waste caused by fuel pump pulsation. It eliminates carburetor overflowing and fuel "surge". Stops the annoyance and danger of "motor cut-out". As this precision regulator s-m-o-o-t-h-s fuel flow, it also prevents vapor lock and percolating. It pays for itself ten-fold with gas savings, by eliminating frequent carburetor adjustment and by reducing engine and carburetor wear. Fits all cars and trucks. 15 day "money back" guarantee! Postpaid..... **$7.95**

Before—After

(Or send $1.00, balance C.O.D.)

NEWHOUSE AUTOMOTIVE INDUSTRIES Dept. AX-1, 5805 E. Beverly Blvd., Los Angeles 22, Calif.

World's Largest Distributors of Speed-Power-Economy Equipment

AMAZING NEW MOTOR RENEW KIT OVERHAULS MOTOR IN 10 MINUTES

- *RESTORES POWER*
- *ELIMINATES PISTON SLAP*

CLEANSE with "MOTOR PURGE"

In the FIRST step of the famous Motor Renew treatment, the "Purge" formula cleans, quiets and frees rings, valves and pistons from efficiency and power robbing carbon, gums and varnish. Pour this miracle solvent into the cylinders, run your motor and watch the combustion residue billow out your exhaust pipe.

RENEW with "COMPRESSION SEAL"

RESTORE COMPRESSION...GET NEW POWER, SPEED AND ECONOMY

with "Compression Seal"! As the SECOND step of the Renew treatment, squeeze this self expanding mineral compound into your cylinders where it can fill worn spots (which cause compression leaks) between cylinder walls and pistons. Thus it restores compression . . . cuts oil-gas waste and eliminates costly engine overhaul and ring jobs.

100% MONEY BACK GUARANTEE!

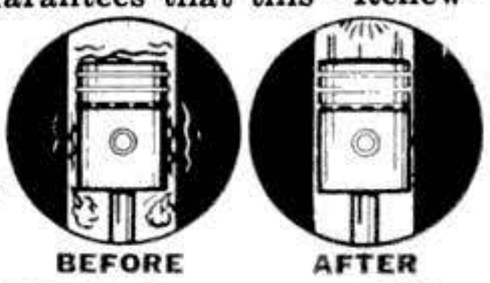
A $100.000 insurance policy guarantees that this "Renew" treatment will not harm the finest engine.

DEALER INQUIRIES INVITED!

FREE Auto Manual With Each Order!

Kit treats all cars and trucks

$6.95 POSTPAID (Or send $1 deposit, balance C.O.D.)



CONSOLIDATED ENGINEERING, Dept. PSK-1

10407 W. Washington Blvd. Culver City, Calif.

Increase "gas" mileage!

10 DAY FREE TRIAL IN YOUR CAR

This new air-bleed idling jet replaces present solid idling adjustment screw in your carburetor. The object is to lessen the vacuum in the idling channel by bleeding air during high manifold vacuum periods and thus, try to increase Your Gas Mileage. ABOUT 1/2 MILLION NOW IN USE. Most users who write us swear by them and some report up to 25% more mileage. Many comment on Smoother Motor, Easier Starting, Faster Pick-Up, Better Idling. But some swear at them with "No Improvement" and fire "the little stinkers" back—proving Gane's can and do sometimes fail completely. So we invite you to try "the little stinkers" at "no cost", to see what they will do for you. Make NO deposit. Send NO money. Pay postman NOTHING. There are NO reservations, qualifications nor restrictions to this TRY BEFORE YOU BUY—10 DAY FREE TRIAL OFFER. Just mail this coupon today. GANE NEEDLES, with literature, will be promptly sent you postage paid. You, or your service station, can quickly make the simple, easy installation.

USE GANES 10 DAYS—Check for increased gas mileage which must average 2 or more extra miles per gallon. At the end of ten days send us only $1.50 per Gane Needle in check, currency or stamps or else send them back and owe nothing!

OCTA-GANE, Dept. GS-1
605 W. Las Tunas, San Gabriel, Calif.

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Address.....

City.....Zone....State.....

Year & make of car.....No. cyl.....

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NOW! SAW 2x4's IN ONE EASY CUT WITH NEW LARGER 'ARCO-SAWS'

AT BETTER HARDWARE STORES EVERY-WHERE

'ARCO SAW'

No. 455 "ARCO-SAW" For Depth & Bevel Cuts with ALL GAGES & 5" "ARCO SAFECUT" Blade. $12.50

No. 454 "ARCO-SAW" For Straight Cutting. Same as above, less gages. Has accurate visual Guide..... $10.95

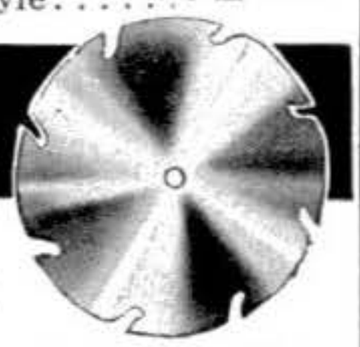
AMAZING NEW SAFE-CUT BLADE ALLOWS ANY ¼" DRILL TO WHIZ THRU HEAVY LUMBER, WALLBOARD, PLYWOOD, etc.

At last, here are the first—**the only**—gear driven saw attachments to whiz thru 2x4's in one cut! Imagine, now you can build **anything** from bookcases to a bungalow with these sensational new saws. A moderately priced drill will do the job because of new "ARCO SAFECUT" Blade.

ONLY "ARCO" GIVES YOU THESE FEATURES: 5-inch Safecut Blade—cuts faster—uses 30% less power, **Graduated Depth & Bevel Gages** for cuts to 1¾"—bevels from 0 to 45°. **Adjustable Rip Gage & Visual Guide, Sturdiest and Easily Adjusted Safety-Yoke** keeps drill steady, **Worm Drive Clamp** releases drill in seconds. **Precision Gear Box with Steel Gears, 90-DAY FACTORY GUARANTEE.**

REPLACEMENT BLADES: Specify 5" Safecut, or Combination, or Rip, or Crosscut Style..... **$1.75**

NEW! 'ARCO SAFECUT' SAFETY SAWBLADES



The Safest, Fastest Cutting Sawblade Ever Made! Made of finest tempered tool steel. No "Kick-back" accidents — cannot drag hand into blade. Easily & quickly resharpened with ordinary handfile.

6" Blade...$1.75 7" Blade...$1.95 8" Blade...$2.15

Special Bores for Skil, Mall, B&D Saws—Add 30c

Unconditional 10-Day Money Back Guarantee on all Items

DEALERS: Write for nearest jobber

BUY THE BEST—see your hardware dealer now! Don't accept inferior substitutes—if not available send us check or M.O. (Postpaid). C.O.D.'s—postage extra.

ARROW METAL PRODUCTS CO.

Dept. PS-1, 140 WEST BROADWAY, N. Y. 13, N. Y.

You Don't Need MUSCLES

... with a **VISE-GRIP WRENCH**

Locks To Work With TON-GRIP

Model 10-W, $2.60

Leave your TOUGH fixin' jobs to Vise-Grip! A squeeze of the hand, and powerful jaws lock to work with **Ton-grip.** Won't slip! You can turn, twist, hold, bend, cut, ratchet. So E-A-S-Y, so FAST! 7" and 10", with or without cutter. Only $1.85 to $2.60 at your dealer.

Manufactured Only By

PETERSEN MFG. CO., INC.

Dept. M-1 DeWitt, Nebr.

ORDER BY MAIL from PALLEY'S

NEW HY-SCORE .177 CAL. AIR PISTOL

The finest Air Pistol you have ever seen. For that Target or small game shooting. Recommended by General J.S.Hatcher in April 1952 issue of the American Rifleman. No pumping necessary – just cock and fire. Has an ALL STEEL rifled barrel, 7-3/4" long. Will give a higher muzzel velocity than any other air gun. Shoots .177 caliber pellets or darts. Also available in 22 cal. or BB. Write for information on other models. **14.95**

CLAMP-ON-ANYWHERE LAMP

One of the handiest lights, you can own! Clamps on anywhere. Fully adjustable ball swivel lets light move freely. Can be used with ordinary bulb, photoflash or photoflood. Also use as reading lamp, work lamp, etc. Socket assembly includes clamp, adjustable swivel, cord and plug..... LAMP ALONE..... **1.39**

Spot reflector (5" diameter)
Parabolic flood reflector (9" diameter) } **1.09 EA**

NAVY SEALED BEAM LIGHT

U.S.NAVY Portable Search-spot light. Has a pistol grip and aiming sight. Makes an ideal search, spot or emergency light for Home, Car, Boat or Camp.

12 Volt light – 4" lens. **4.29** 24 Volt light – 5" lens. **4.79**

4-WAY SWIVEL LAMP

A handy light for desk, work bench, chart table, engine room, etc. Can be used on 6–12–24–110 volt by changing bulb. 3 ft. shaft has 4 joints to adjust position..... **3.29**

FLEXIBLE GOOSENECK LAMP

A real Surplus Buy! For the Home or Workshop. 110V, AC. Has flexible shaft, long wire, socket, switch, plug and mounting bracket. **1.25**

U.S.NAVY PHONE SET

Used by the Navy for flight deck and gunnery control. An ideal emergency communication system because they require no power supply. Perfect for office-to-shop, house-to-garage or barn, or any point-to-point within a ½ mile radius. These sets are fully Sound Powered. Each set includes 2 phones on chestplate, 2 headsets, button switches & approx., 35 ft of cable. **10.95 PR.**

One phone and headset..... **5.95 EACH**

UTILITY BAG

Room to carry ammo, flashlight, compass, camera, maps, food, first aid kit, etc. Made of Heavy O.D. canvas. Has a wide, adjustable shoulder strap. Two rings on each side for tying on extra equipment. Inside has two large compartments. Cover straps down. Size: 12"x7"x4". **1.29**

CUNO OIL FILTER

An aircraft type oil filter which can easily be adapted to autos, etc. Will keep oil clean without a cartridge replacement. Can be installed in minutes. Has two mounting braces. Lge size, 5/8" tube ports.

A real SURPLUS BARGAIN. **6.95**

INSIDE-OUTSIDE VERNIER CALIPER

German made by one of Europe's leading specialists in precision tools. Measures inside – outside – depth in .001" to 6" in 1'000-ths and 1/10mm to 150 mm in 10 ths. GUARANTEED..... **9.75 NEW**

STAND MAGNIFIER

Handy stand magnifier with universal adjustment. Overall height: 6". Has a powerful, clear magnifying lens.. **1.49**

MAGNETIC BASE INDICATOR HOLDER

Time saver for precision checking. Magnetic base fits curved or flat surface. Has 45–50 lb. pull. 6½" stainless steel rod which is mounted in ball socket to permit universal settings. **3.50**

NOTE: We have complete line of instruments, depth gauges, inspection mirrors, etc. Write Today!

REPAIR KIT

An all-purpose kit! 6 useful tools – a fine steel trimming knife – pair of genuine WISS heavy duty scissors – a steel roller for cementing seams in fabric, wallpaper, etc Two 12" half round files – a wire burnishing brush. Complete in cloth case. Ideal for wallpaper and linoleum. A 9.50 VALUE **3.29**

BENCH CLAMP

Carpenters, wood workers, cabinet makers – you need this one! Opens to 8" with 2-3/4" thumb screw. All steel, sturdy & dependable. Handy for clamping, glueing, assembling, etc. **1.59**

PALLEY'S DEPT. PS-1, 2263 E. VERNON AVE., LOS ANGELES 58, CALIF.

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PALLEY BARGAINS

SAVE UP TO 85% ON WAR SURPLUS

RADIO MIX

Ideal for 'ham' operators, experimenting, etc. Mix contains: Headset, mike, button, trans. wire, insulators, switches, condensors, rheostats, terminals, jump cable, etc. 8 packed lbs. **2.49**

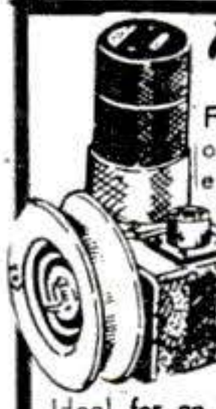
RADIO HEADSET

HS-30U – Two magnetic type receivers in watertight brass case. Soft rubber inserts in each receiver to fit into wearers' ear. Pliable steel head band. Ideal for communications, divers, workers in noisy compartments, etc . . . . NEW **3.29**

MICROPHONE

Popular telephone type, highly sensitive. Has excellent, clear tone. This was the Signal Corps favorite. An ideal instrument for the Radio "ham" and professional recording studio, for broadcasting, home recording, public address systems, etc. Comes complete with cord & plug. **3.29**

RADIO ANTENNA REEL



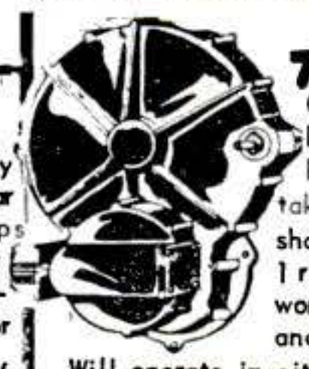
For tuning beam antenna, opening and closing doors, etc. Powered by 1/8 HP, 24V, GE motor, engaged to a gear reduction only when electrical contact is made. Operates in either direction. Ideal for an auxiliary power take-off. Has 150 RPM at take-off.

NEW **8.75** USED **6.75**

MAKE YOUR OWN POWER UNIT

Here's a unit PACKED WITH BRUTE FORCE! Does all those hard, heavy jobs that ordinary Power Tools cannot handle. Easily made from a vacuum cleaner type motor, a gear reduction drive and a few homemade parts. Can be used for turning large nuts & bolts, digging post holes, drilling large holes in wood or metal, driving power tools, & machinery, lifting, pulling, pushing, or any job where a slow speed with high take-off is required. YOU CAN'T STALL IT! Lightweight, easy to handle. Has 1000's of uses in the home, garage, shop, factory. We supply complete instructions.

3 SPEED TRANSMISSION



Converts a high speed, low power input into low speed, high power take-off. Has 2 take-off shafts at 4 to 1 and 16 to 1 ratios. Gear box has a worm drive, bronze gears and a throw-out clutch. Will operate in either forward or reverse directions. Adaptable to many uses on power machinery. . . . **19.95**

90° TRANSMISSION

Has 1½ to 1 gear reduction through bevel gears. Pre-lubricated bearings in dust proof housing. – A Positive lever control clutch . . Size: 7" x 6". – 3/4" take-off shaft **3.95**

AMAZING BERNZ-O-MATIC TORCH

It makes the old "blow-torch" obsolete. Here is a self-contained fuel & burner unit that does a job where intense heat from a concentrated flame is necessary. It is absolutely SAFE! (ICC approved). Has a replaceable fuel cylinder of high quality steel

PENCIL FLAME Type-with 10 hour cylinder and (1) burner unit **ONLY** **6.95**

EXTRA FUEL CYLINDERS. **1.95**

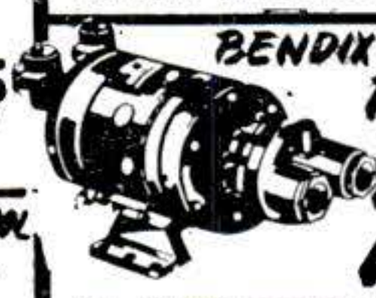
PRESSURE TANKS

G-1 Type–Stainless Steel, shatterproof & rustless. Has reinforcing ribs and is pressure tested up to 400 PSI, Has high safety factor. Both ends have 1/4" pipe ports.

Ideal for use as a buoy, drinking water supply, underwater fishing, diving, painting, cooking, or spraying.

G-1 – 12½" x 24" **ONLY** **10.95**
D-2 Tank- 500 cu. in cap. . . **3.95**
A-4 Tank- 104 cu. in. cap. . . **1.95**

BENDIX HYDRAULIC PUMP AND MOTOR 19.50



Has 3½ GPM capacity at 600 PSI. Motor is 1½ HP, 24V, DC. Operates on either 12 or 32V, DC current. Has built-in relief valve adjustable to 1500 PSI. This unit ideal for bait tanks, hyd. lifts, portable loaders, etc. Cost Gov't approximately $350.00.

MAKE YOUR OWN HYDRAULIC REMOTE CONTROL

The ideal remote control for hundreds of uses such as throttle controls, engine & motor controls, switches, machinery, on large & small boats, in shop or factory, etc. Eliminates messy cables, pulleys, wire & rope connections. Gives positive, full range, instant action. Kit has two No. 3 Hydraulic Cylinders, shut-off valves, bleed valves and all fittings. The two cylinders are connected by tubing (any length) and filled with oil. When Master is moved the Slave responds equally in movement and pressure. Master may be used with many slaves by simple adaption.

KIT ONLY 17.95

Hydraulic Copper tubing for use with above unit . . 18¢ run ft.
Complete assembly instructions furnished with each kit.

GADGET MIXES

GADGET MIX – Rivets, Spacers, Bolts, Screws, Gears, Wheel Bearings, Springs and Clamps. 5 lbs. **1.19**

BEARING MIX – Approx. 20 Needle, Ball & Roller bearings. New and Used. Sizes: 1/2" to 4". Some cost Gov't $10 apiece. 5 lbs. ONLY **1.59**

FILE MIX – 10 assorted Files. 4" to 12". Includes Vixens, Half Rounds, Mills, Bastards, etc. In seconds and used but good condition. One vixen alone is worth our price for the entire mix . . . . . **99¢**

32 POSITION SWITCH

Was used as a bomb selector switch. Has 32 separate contact points through 1 common lead. Ideal for use in radio, experimental work, electronics, shops, factories, etc – Has 32 post, Amphenol connector plug. Uses 12–24 volts. current. In all metal case. **3.95**

AGASTAT-TIME DELAY RELAY

A 24 volt solenoid is held from a fraction of a sec. to 15 seconds by a Time Delay mechanism. When coil is energized it operates a double pole, single throw relay switch. Can be used on electric locks, animated signs, labs, etc. Fully adjustable by set screw **2.25**

WESTINGHOUSE AIR COMPRESSOR

1000's now in use for spraying, inflating, air tools, in garages, laboratories, shops & on trucks, tractors, jeeps, etc. Lightweight but powerful. Operates on 1/2 HP, gas or electric motor Runs in either direction. Delivers approx. 3.27 CFM at 600 RPM or 6.54 CFM at 1200 RPM. Has 2" bore, 1-1/2" stroke.

We also have available motors, tanks & fittings to adapt this unit. **23.95**

230 PAGE CATALOG

1000's of ITEMS! Fully ILLUSTRATED! For the **MECHANIC, SPORTSMAN, HOBBYIST, HOME OWNER, etc.**

War Surplus — Factory Closeouts and General Merchandise Values! Save on Hardware, Hand & Power Tools, Gadgets, Sports Equipment, Hydraulics, etc. **SEND 25c for HANDLING & MAILING.**

PIANO HINGE

1¼" x 53½" Cad. Plated Steel . .	$ .89
1¼" x 72" Aluminum	1.29
3½" x 54" Stainless Steel	1.98

AIRCRAFT CABLE

Rust resistant, alloyed steel. Extra flexible. Pre-formed, 7 x 19 strand. On reels.

1/16"	4½¢ ft. (7x7)	7/32"	11½¢ ft.
5/64"	5¢ ft. (6x7)	1/4"	12½¢ ft.
3/32"	5½¢ ft. (7x7)	9/32"	15¢ ft.
1/8"	7¢ ft. 7x19	5/16"	16½¢ ft.
5/32"	7½¢ ft. "	3/8"	18¢ ft.
3/16"	10½¢ ft. "	1/2"	20¢ ft.

Stainless Steel Cable – Pre-Formed

1/16"	7¢ ft.	5/32"	20¢ ft.
1/8"	18¢ ft.	3/16"	23¢ ft.

Bronze Cable – Not Pre-Formed

1/16"	5¢ ft.	5/16"	23¢ ft.
1/4"	17¢ ft.	1/2"	38¢ ft.

ELECT. GYRO

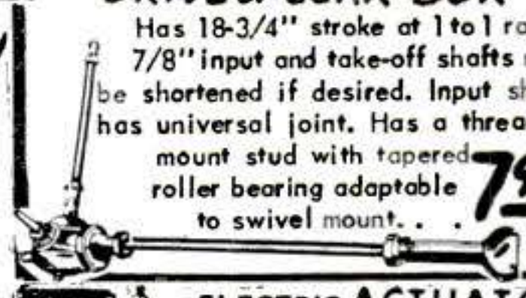
50,000 RPM Motor is an integral part of balance wheel. Has double-end shaft to drive precision tools or machinery at precise, controlled speeds. Ball bearing mounted. High or low voltage. Ideal for experimental work, labs, hobbyists, technicians, etc. **4.95**

ORDER BY MAIL!

2-WAY INTERCOM PHONES

Install this set of desk telephones for perfect, two-way communication between any two points up to 100 ft. This handsome set comes in a blue enamel finish. Has 2 phones, wire and simple hookup instructions. Operates on ordinary flashlight batteries. Here is the ideal set for use room to room, garage to house, barn to house, darkroom to outside, office to office or shop. Stock is limited! ORDER TODAY! **7.50**

RIGHT ANGLE SPINDLE DRIVE or GEAR BOX



Has 18-3/4" stroke at 1 to 1 ratio. 7/8" input and take-off shafts may be shortened if desired. Input shaft has universal joint. Has a threaded mount stud with tapered roller bearing adaptable to swivel mount. . . **7.95**

ELECTRIC ACTUATOR

NEW

Foote Linear **Actuator**– Has hundreds of uses for any mechanical device needing controlled two way action. Will open, close, raise or lower doors, windows, gates, etc. Has a 8500 RPM, 1/6 HP series wound motor. Operates on 24V DC current. Gives 4-1/2" stroke in 13½ secs. Compression and tension loads up to 750 lbs. Has adjustable micro switch for limits of travel. Overall length retracted is 11 inches. . . **7.95**

EASTMAN ACTUATOR

Has a 1/8 HP, 24V, DC, 10,000 RPM motor & push–pull actuator. Actuator has a 4" travel through a reduction gear box. Has adjustable limit switches and forward and reversing reversing relays. Overall length extended, 20"; retracted 15½". **12.95**

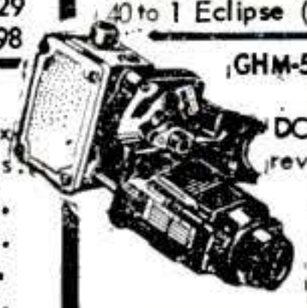
GEAR HEAD MOTORS

GEAR BOX **7.95**
MOTOR ALONE **4.95**

Heavy duty, G.E. motor. 2 HP, 24V, DC, 125 amp., reversible motor to drive a reduction gear unit giving 36 to 1 ratio at take-off. Unit will operate on 6 or 12 volts

36 to 1 G.E. (306 shaft RPM)
28 to 1 Eclipse (130 shaft RPM)
40 to 1 Eclipse (110 shaft RPM)
10.95 EACH

GHM-528 Lear GEAR HEAD MOTOR



– Lear 24 volt DC, 7.6 amp, series wound reversible motor with overload clutch. Motor turns 11,000 RPM driving thru a 11 to 1 gear reduction box which turns the final take-off shaft 1000 RPM. Adjustable limit switches control limit of travel. Take-off shaft adapts to flex or rigid drive. Size: 10"x4". **9.95**

FIRE EXTINGUISHER

Kiddie Lux – CO^2 Type. Built to Gov't specifications. Has heavy, shatter-proof case. Recent hydrostatic test. Reconditioned and fully charged. LIKE NEW! All are READY FOR INSTANT USE!

3½ lb. size with Swing Nozzle . .	$14.95
7½ lb. size with Horn	21.75
10 lb. size with new Squeeze Grip Handle & 3½ ft. flex hose with Horn	27.75
15 lb. size with Wheel Control . . .	35.75
15 lb. size with Squeeze Grip Handle, 4 ft. flex hose, Plastic Horn . .	39.95

PALLEY SUPPLY CO.

2263 EAST VERNON AVENUE
DEPT. PS-1
LOS ANGELES 58 CALIF

Order From This Ad. Pay by M.O. or check. P.O's. accptd. from D&B firms ½ deposit with C.O.D's. All Prices FOB Los Angeles.

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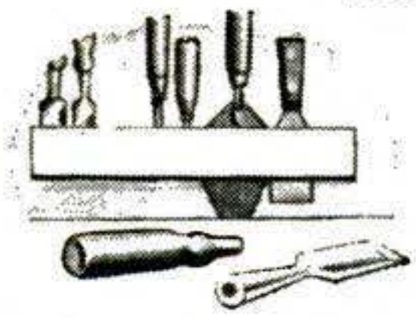
TIME SAVING TIPS

ALL YOU NEED IS A TUBE OF

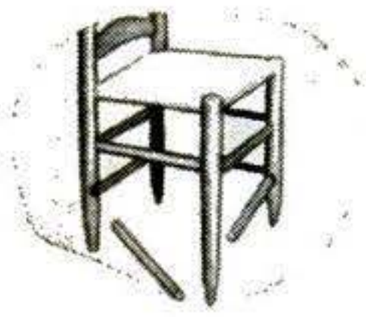
DU PONT DUCO CEMENT

REG. U.S. PAT. OFF.

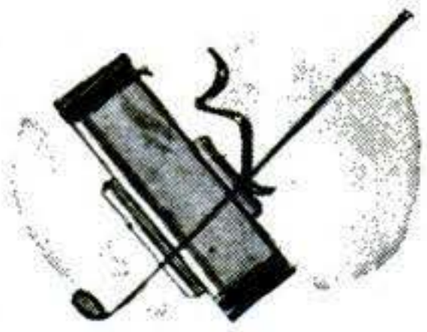


WHEN HANDLES COME OFF, put 'em back on to stay with "Duco" Cement. It's a must in the tool room.

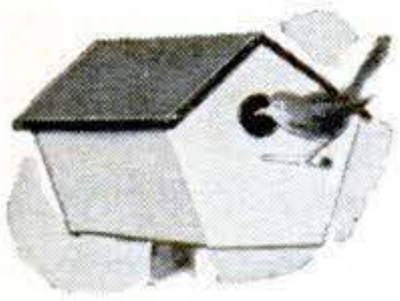
LOOSE REAR-VIEW MIRROR? It'll hold fast if you put it in its place with strong Du Pont "Duco" Cement.



REPAIRS CHAIRS. Strong "Duco" Cement puts loose rungs in so they'll stay. Makes chairs sturdier.

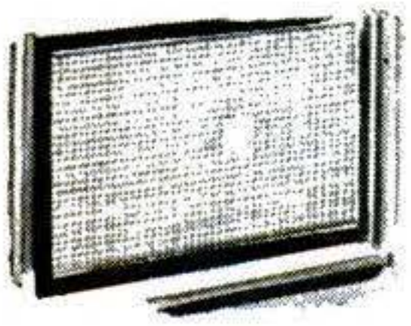


LOSING YOUR GRIP? Anchor loose golf-club grips with "Duco" Cement. Good for tennis-racket grips, too.



FOR THE BIRDS. Build an attractive birdhouse. You can make it strong and neat with "Duco" Cement.

COAT STRIPPED THREADS with "Duco" Cement for new gripping power. Perfect for emergency repairs.



KEEP BUGS OUT by mending small tears in screens with strong, transparent, waterproof "Duco" Cement.

WATERPROOF MATCHES for camping trips. Dip them in easy-to-use "Duco" Cement, and wipe smooth.

A HOUSEHOLD FAVORITE FOR 25 YEARS

DU PONT

REG. U.S. PAT. OFF.

BETTER THINGS FOR BETTER LIVING ... THROUGH CHEMISTRY

I've Ridden in a Flying Warehouse

[*Continued from page 159*]

blisters in the plane's sides. Slowly Pittard backs up the plane and then awaits clearance from the tower to take off.

Off go the brakes and at 6:25 the back of your seat rushes up and slaps you with a mighty forward thrust.

At a time like this you look for reassuring facts. You remember that XC-99 once climbed easily from Travis Field lifting 160 tons, 13 more than today.

At 95 miles an hour the nose rises slightly. One long breath later the main gear breaks away. You are off and flying.

By 6:45 you are at 6,800 feet, cruising at 195 miles an hour. The engines, you learn, are now developing only 1,700 brake horsepower each. But in an emergency, her 168 cylinders would quickly unleash a total of 21,000 horsepower.

West Texas is sliding away beneath the 230-foot wing behind you. Inside that wing are 9,000 gallons of gas and 600 gallons of oil. On long-distance flights, she can stow enough fuel to carry her a third of the way around the world.

One of Its Kind

Approaching Sacramento's McClellan Field, Pittard brings XC-99 into the right-hand traffic pattern. Airspeed drops from 180 to 120 miles—slightly above stalling. XC-99 is settling gently. There is no bump, no bounce, as your glide ends.

It is no secret that while the top brass are well pleased with XC-99, they will probably never build another plane to the same specifications. Already there is talk of other models whose Gargantuan proportions would convert XC-99 into a medium cargo plane. In short, "X" stands less for "experimental" than for the unknown factor in the modern military riddle: How big is BIG? END

Fly Power

Hubby: "Just look at the power in this new car—we're actually flying!"
Wife: "Yes, dear, but hadn't you better move to the side of the road so that policeman on the motorcycle can get by?"—*Franklin News.*

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FACTORY PRICES

YOU PAY LESS THAN 50% RETAIL

SATISFACTION UNCONDITIONALLY GUARANTEED

EXTENSION CORD

(Item 16) 40 ft. **heavy duty,** made of specially insulated No. 14 2-conductor wire. So tough that you can drive over it and yet flexible and easy to handle. Resists oil, grease or water. Extends electricity up to 400 ft. without voltage drop. Use indoors or out. Complete with heavy rubber plug and outlet. Wt. 2½ lbs. Usually $4.50—Special 40 ft.....**$1.99**
Comb: 2-40 ft. and 1-20 ft. (total 100 ft.).....**$4.95**
100 ft. length (one piece) **$4.85**
WIRE ONLY (Item 50)
No fittings. 100 ft..... **$4.00**

HEATING & VENTILATING FAN

(Item 10) Easily installed in furnace pipes. Forces even heat to all rooms. Over range, removes kitchen smoke and odors. Powerful continuous duty motor, 110-120 v. A.C. Quiet, super efficient fan moves huge volume of air (400 to 600 c.f.m.) 8" Fan, wt. 5 lbs., **$6.85;** 9" Fan, wt. 6 lbs., **$7.85;** 10" Fan, wt. 7 lbs., **$8.85;** 12" Fan, wt. 8 lbs., **$9.85.**
HEAVY DUTY 12" fan, enclosed motor, suitable for spray booths, restaurant exhausts, poultry houses, and other difficult applications. Wt. 12 lbs. Item 10D. ..**$12.95**

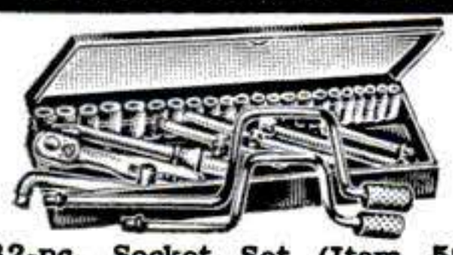
RUBBER HOSE

New genuine Neoprene Hose—outlasts ordinary rubber 3 to 1. Reinforced with super tough cotton cord plies. Flexible. Easy Flo brass couplings with standard pipe threads for quick connections, included. Pump water for irrigation, stock tanks, home, barn, fire fighting, etc. Pump Gas or Fuel Oil. Save more than 60%.

In. Diam.	1"	1¼"	1¼"	1¼"	1½"
Length	10 ft.	25 ft.	50 ft.	100 ft.	30 ft.
Price	$5.95	9.25	24.75	49.95	14.75

If specified we will send special hose for gas or oil at same prices.

32 Pc. SOCKET SET



32-pc. Socket Set (Item 59) Highest quality guar. non-breakable sockets made by Husky. Beautiful, matched chrome alloy, absolutely the best. Complete range of 21 sockets from ¼"thru 7/16" in ¼" drive and 7/16" thru 1-1/16" in ½" drive; 2 extensions, reversible ½" ratchet, adaptor bit, slide head, all angle coupling, 2 end wrenches, ¼" speeder handle and sturdy metal tool box. For prof. mechanics who want the best. Wt. 14 lbs. Easily worth $41.50. While they last only..... **$16.95**

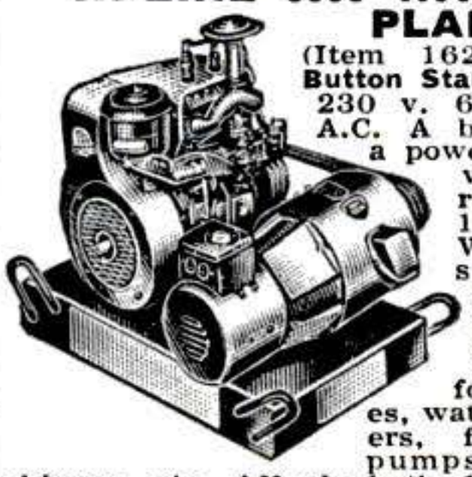
45 Pc. SOCKET SET

(Item 205) Contains a complete set of sockets in ½" drive, ⅜" drive and ¼" drive, plus all necessary extensions, handles, speeders, reversible ratchets, etc.; all uncond. guaranteed against breakage. Beautiful matched chromed thin wall alloy sockets in a sturdy handsome steel tool box. Wt. 17 lbs. List price $62.90. Factory Special.....**$26.95**

HYDRAULIC JACKS

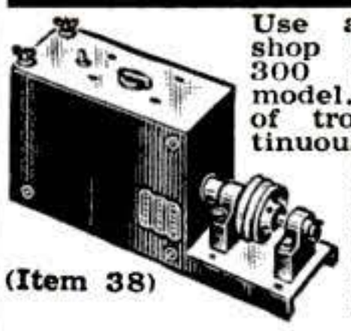
(Item 208) Heavy duty, precision built, smooth, positive acting with built-in relief valve. Hi-Lift with screw extensions. Govt. surplus at a fraction of orig. cost. (Handle included.)
11½ ton (Item 208) Wt. 11 lbs..... **$6.45**
3 ton (Item 208A) Wt. 15 lbs..... **$9.45**
5 ton (Item 208B) Wt. 17 lbs..... **$11.45**

HI-LINE 6000 WATT PLANT



(Item 162) **Push Button Start,** 115-230 v. 60 cycle A.C. A brute of a power plant with a rugged 13 hp. Wisconsin engine. Plenty of electricity for ranges, water heaters, freezers, pumps, machinery, etc. Affords both 110 and 220 volts. Ideal where heavy current is needed. Wt. 590 lbs. Easily worth $995.00. **With self starter.** Factory price... **$645.00**
Generator and control box only, belt driven. Use your own engine or tractor. Wt. 240 lbs. (Item 163) Factory price. **$345.00**

HEAVY DUTY D-C ARC WELDER



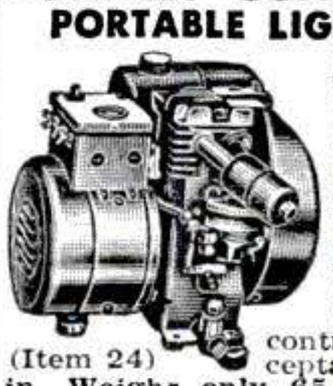
(Item 38)

Use as portable or shop welder. Up to 300 amps. Senior model. Made for years of trouble-free, continuous service. Will handle light or heavy jobs. Easily welds up to ¾" plate using ¼" rods. Built-in air cooling system. Arc is easy to strike and hold, because of specially designed arc stabilizer. Hi-lo switch and dial control gives wide range of welding heats. Run welder at 2600 rpm. with tractor, jeep or 15 hp. gas engine, or 7 hp. elec. motor. Complete with instructions, guar. and double V belt or flat pulley. You can pay more, but you can't buy a better welder. Wt. 110 lbs. $400 value at..... **$99.75**
DUAL CONTROL MODEL same as above but with built-in dual rheostat for low heat soldering, brazing, welding. Spec.. **$119.50**
WELDING KIT. Two 10 ft. leads, welding helmet, electrode holder, ground clamp. Sold only with welder at..... **$10.50**
Write for prices on A.C. Arc Welders.

HEAVY DUTY POWER CABLE

#12–2 Cond.–stranded, very flexible, rubber covered, special outside conductor for grounding power tools, etc. Finest heavy duty power cable made. 50 ft. (Wt. 8 lbs.) Item 199....**$6.95**
100 ft. (Wt. 16 lbs.) Item 200..**$12.95**

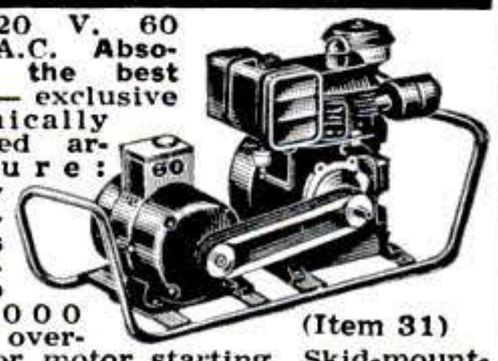
PORTABLE LIGHT PLANTS



(Item 24)

350 watts—115 v. D.C. powered by a sturdy, easy-starting 1½ hp. Briggs engine, perfect for lights, radios, razors, etc. in cabins or trailers. Use standard light bulbs. Built-in control box with receptacle — just plug in. Weighs only 65 lbs. Item 273. Reg. price $199.50. A terrific value at..... **$99.75**
PUSH BUTTON START A.C. PLANT 500-700 watts—115 v.—60 cyc. A.C. Powered by a rugged 2 hp. easy-starting Briggs gas engine. No wiring necessary, just plug in and operate. Plenty of current for any oil burner, freezer, brooder, emergency lights, etc. which require up to 700 watts. Ideal for Civil Defense, Fire Depts., trailers and camps. Complete with Voltmeter and built-in winding to charge 6 v. auto batteries. Item 24. Wt. 85 lbs. Fully Guaranteed. **Be Prepared if war or storm knocks out power lines.** Reg. $275 value..... **$143.50**
1000-1200 Watt Plant (Item 45) same as Item 24 but larger generator and engine... **$199.50**

GIANT 2000-2500 WATT PLANT



(Item 31)

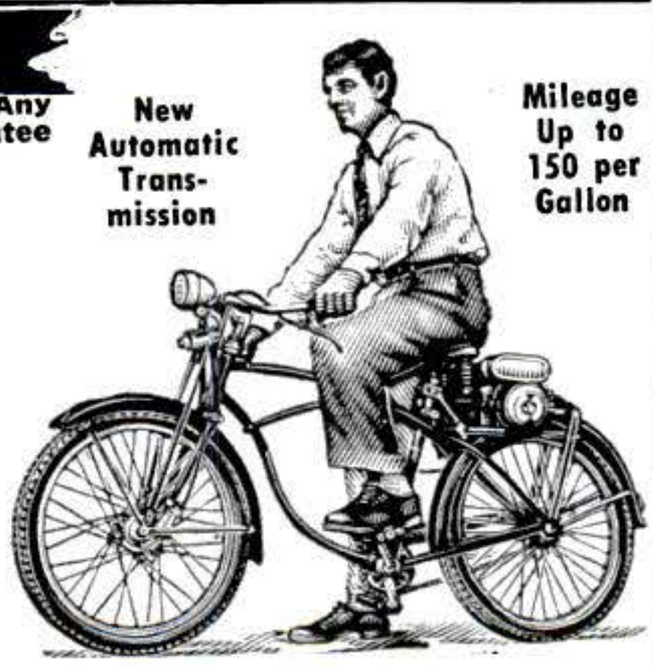
110-120 V. 60 cyc. A.C. **Absolutely the best made** — exclusive dynamically balanced armature: heavy windings develop up to 5000 watt overload for motor starting. Skid-mounted—portable. Powered by easy starting Briggs or 6 hp. Wisconsin engine—complete with all accessories; engine easily disconnected for other uses. Big outlet box, voltmeter, no wiring necessary. Ample current for all purposes. Factory warranty and complete instructions included. Wt. 220 lbs. Reg. price $585.00. Special at.... **$299.50**
With Electric Self Starter..**$359.50**
GENERATOR ONLY and control box. Drive it with your engine or tractor **$169.95**

3000-3500 WATT PLANT

(Item 198) 110-220 v.–60 cyc. A.C. with Wis. Engine, **push button start.** Wt. 370 lbs. Heavy duty.....**$399.50**
Generator only for belt drive, Wt. 115 lbs. (Item 198A).....**$239.50**

COMMANDO MOTOR BIKE

Speed to 40 M.P.H. Travels on Any Kind of Road. Amazing 5 Yr. Guarantee



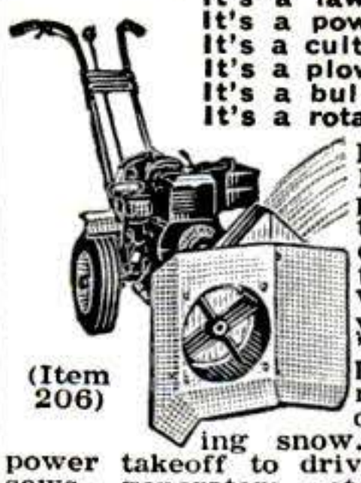
The Commando Motor Bike is new throughout. Advanced engineering—Automatic Clutch provides quick acceleration and easy hill climbing—yet motor idles at will when you stop. No belts or chains. Rugged lightweight 2-cycle engine delivers dependable power with long life. Transmits power direct to rear wheel with modern Dynaro'or. Easy automatic pedal or pull starting. Special control permits pedalling if desired. Perfect balance and comfort. Anyone can ride a Commando Motor Bike—safe and easy. Rear mounting of motor eliminates hard steering, dirt, fumes and heat. Really trouble-free! Rugged heavy duty cycle, custom built by famed Schwinn. Ride for health and pleasure; ride to work or school; make deliveries. Order now. Easy payments available. Ask for free circular.
Commando Motor Bike Town & Country Cruiser Model . . . 1 cyl.–1½ hp. motor, complete—no extras to buy..... **$199.50**
Commando Motor Bike Super Chief Model . . . Motor cycle-type 24" wheels; large flange-type brakes; heavy spring fork; powerful Commando twin cylinder 3 hp. motor. Complete—no extras to buy..... **$249.50**
EXTRA! Convert your own pedal bike into a motorized miracle in one hour with a Commando Motor. Complete with easy-to-follow fittings and instructions. Commando Captain Bike Motor, single-cylinder, 1½ hp., Wt. 35 lbs. Complete—nothing else to buy. Item C90. Factory Price **$125.00**
Deluxe Twin-Cylinder Commando General Bike Motor, 3 hp.. Wt. 42 lbs. Item C91. Factory Price..... **$149.50**
Dealers: Send for our special proposition.

CARRY-AIR

(Item 32) Stainless steel tank—capacity 500 cu. in. at 400 lbs. press. complete with inlet and shutoff valves, press. gauge, detachable air hose, tire chuck. Fill at any service station. Carry air for tire inflation, blowing out lines, spray painting, insecticides, etc. One emergency pays back cost. Wt. 10 lbs. Worth $20.00. Our price.....**$8.95**
(Item 55) With big double tank (1000 cu. in.).....**$11.95**
(Item 58) Tank only, 500 cu. in. (no fitttings).....**$5.95**

MASTER SNOW BLOW

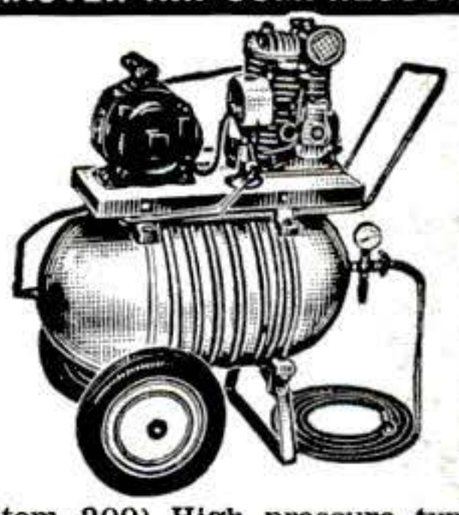
No Pushing — Self-Propelled
It's a lawn mower
It's a power sickle
It's a cultivator
It's a plow
It's a bulldozer
It's a rotary tiller



(Item 206)

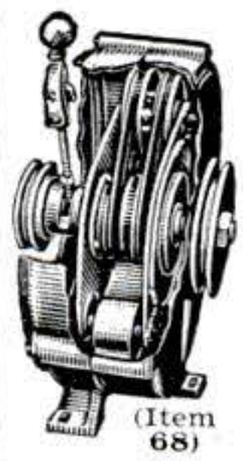
Here at last is a powerunit that does everything. Works for you year 'round. Does terrific job of clearing snow. Built-in power takeoff to drive pumps, saws, generators, etc. Safety clutch—can't burn out. More versatile and efficient than tractors costing twice as much. Basic self propelled 2 hp. tractor—Briggs or Clinton engine. Only **$119.50**
Tractor shown with snow blow attachment.
Snow Blow **$39.50**
Lawn Mower Hitch.....**$4.50**
Cultivator **$8.75**
Rotary Tiller.....**$42.50**
Sickle Bar-Mower.....**$42.50**
Bulldozer **$11.25**
Freight prepaid to most areas. Easy payment plan available.

MASTER AIR COMPRESSOR



(Item 209) High pressure type for large volume of air for heavy duty service. For paint spraying, inflating truck and auto tires, greasing, and the hundreds of other jobs done by compressed air. Piston type. 2" bore compressor with built-in air filter. Master built with hi-strength alloys and precision bearings. Stainless steel tank, 12"x24", 2100 cu. in. cap. Safe up to 500 lbs. Equipped with automatic switch that starts and stops motor to maintain desired pressure (up to 150 lbs.) and check valve, safety valve, gauge, shutoff valve, 20 ft. air hose and tire chuck. Beautifully balanced on ball bearing wheels and rubber tires. Low factory prices.
With ⅓ hp. 110 v. A.C. motor (Reg. $175.00) (Item 209)..... **$98.50**
With ½ hp. motor (Reg. $199.50) (Item 209A)..... **$119.50**
With 2 hp. Briggs Gas Engine (Reg. $199.50) (Item 209B)..... **$109.50**
Write for price of compressor only. A complete line of spray guns and air tanks available.

Variable Speed Selector



(Item 68)

Heavy duty, made by **B. F. GOODRICH** for industrial use. Provides instant speed changes for any drive. For machine tools, dryers, printing, conveyors, production lines, hoists — any operation requiring variable speed. Ideal for midget autos. Employs reliable "trouble free" planetary system. No hydraulic power losses or creeping. Infinite range, smooth operation, easy installation (data included). 3 sizes: ½-1 hp. wt. 36 lbs.; 1-2 hp. wt. 55 lbs.; 2-3 hp. wt. 105 lbs. Reg. list $228, $252 and $352. Our prices . . . **$79.50, $89.50** and **$114.50.**

Factory Prices on Catalog Items

Send 10c for **BIG 1953** catalog. **Hundreds of bargains.**

Prices f.o.b. Factory. 10 day Money back guarantee. Send check or Money Order

MASTER MECHANIC MFG. CO., DEPT. 80-B Burlington, Wis.

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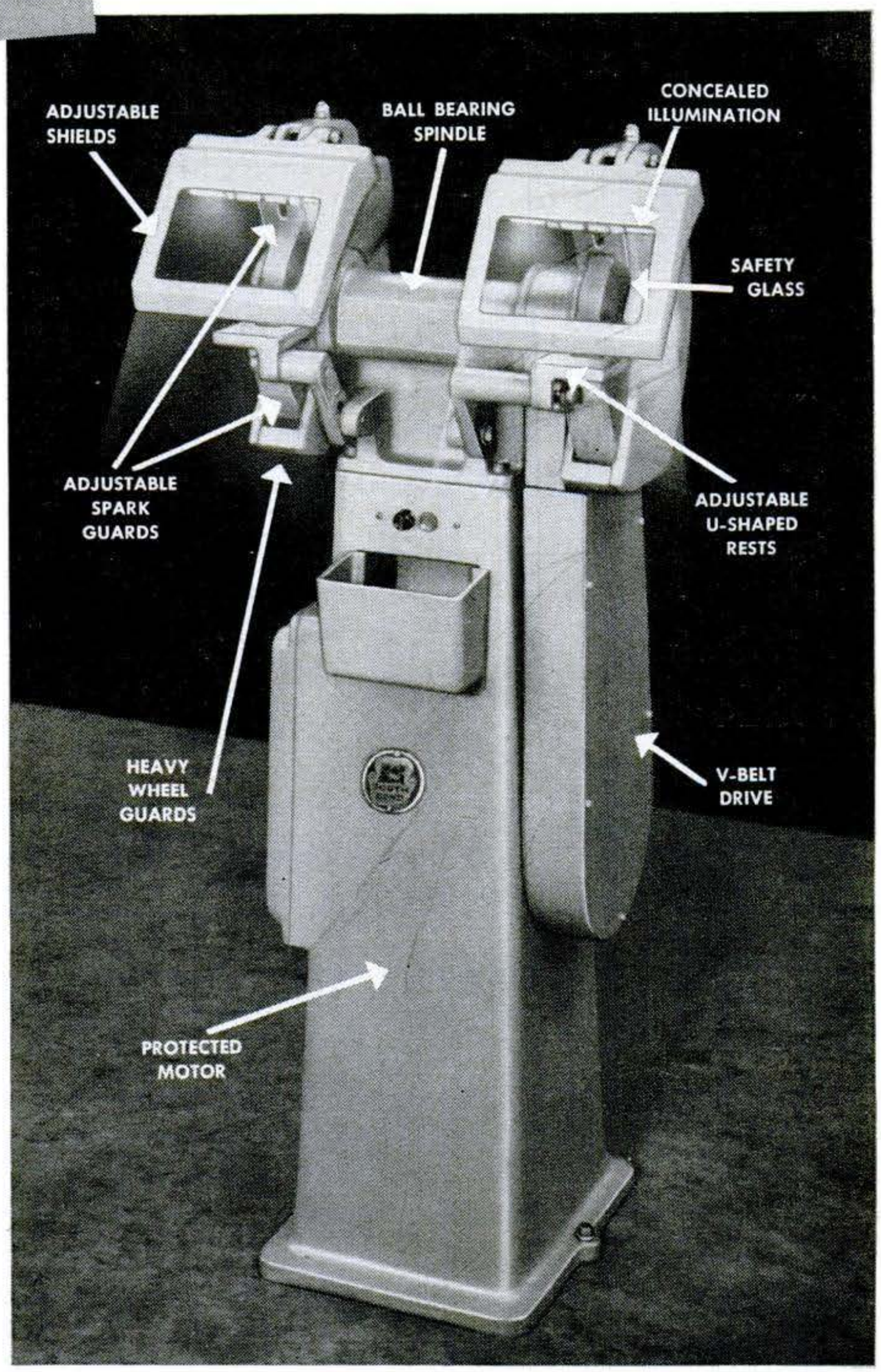
New SOUTH BEND Pedestal GRINDER

A ruggedly built grinder that will give long, dependable service under hard usage. Ideal for production, maintenance and toolroom work. Pedestal mounting of motor provides greater work clearance at grinding wheels and protects motor. Also, removes load and weight of wheels from motor bearings and practically eliminates vibration. Amply powered. Send coupon for full information.



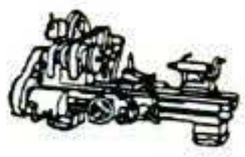
SPECIFICATIONS

Wheel Sizes: 8" (½ h.p. motor), 10" (¾ h.p. motor). **Spindle:** Approximate speed 2450 r.p.m. Sealed ball bearings. **Motor:** Standard 2875 r.p.m. 50 cycle or 3450 r.p.m. 60 cycle, also D.C. **Over-all Dimensions:** 49½" high, 18" wide, 20½" deep (10" Grinder ½" wider).

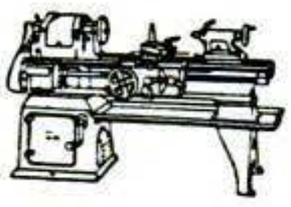
SEND INFORMATION CHECKED:

☐ SOUTH BEND GRINDER

☐ TOOLS & ATTACHMENTS



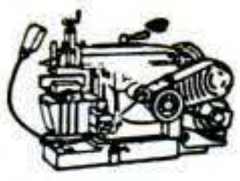
☐ 9" and 10" BENCH LATHES



☐ 10" to 16-24" FLOOR LATHES

☐ ½" and 1" Collet TURRET LATHES

☐ 14" DRILL PRESSES



☐ 7" BENCH SHAPERS

Name_____ Company_____

Street_____ City & State_____

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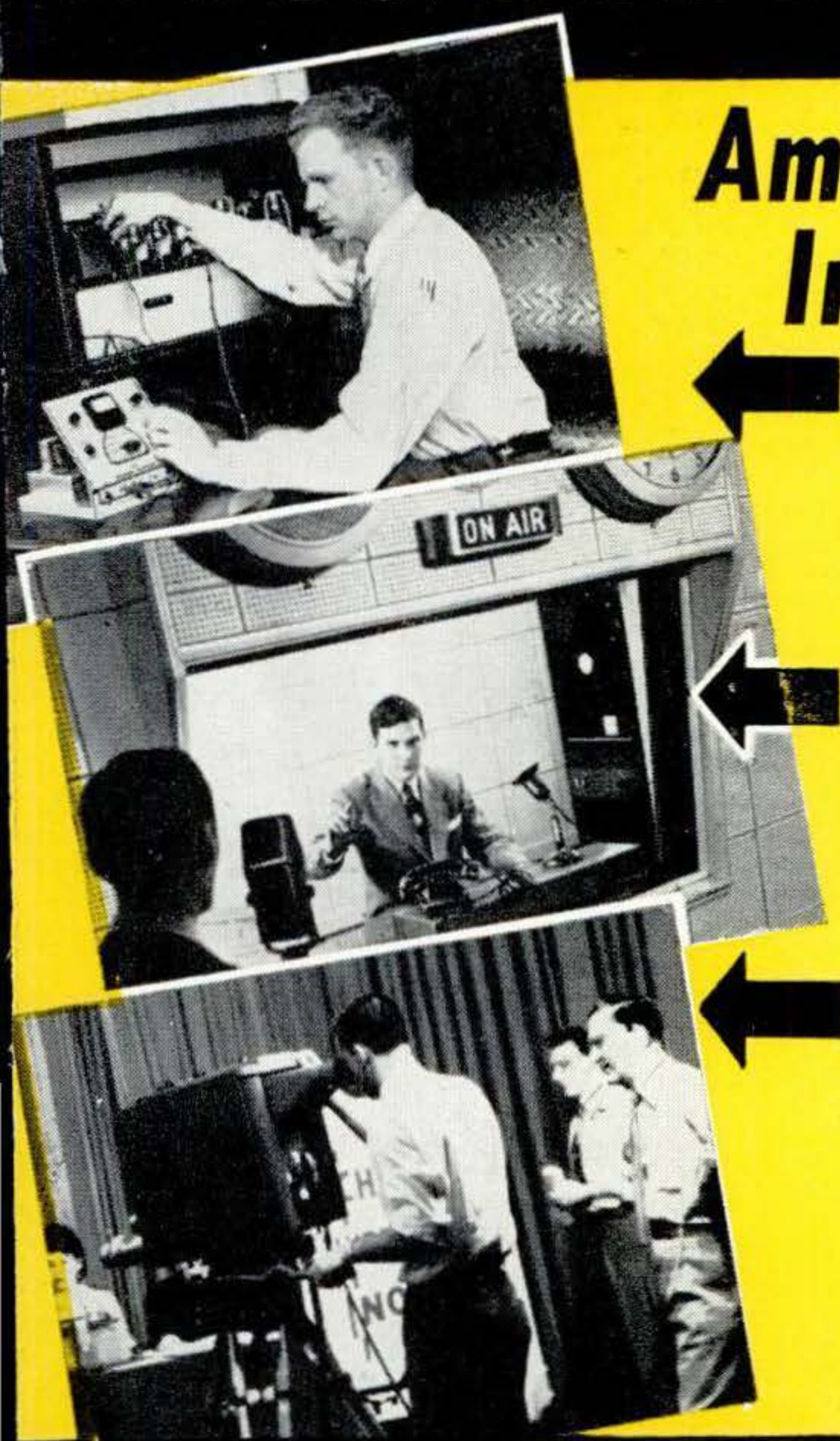
I'll Train You AT HOME in Spar Good Jobs in RADIO-TEL



America's Fast-Growing Industry Offers You

1. EXTRA MONEY IN SPARE TIME

Many students make $5, $10 a week and more EXTRA fixing neighbors' Radios in spare time while learning. The day you enrol I start sending you SPECIAL BOOKLETS that show you how Tester you build with kits I send helps you make extra money servicing sets, gives PRACTICAL EXPERIENCE on circuit common to Radio and Television. All equipment is yours to keep Send postage-free card today for Actual Lesson and 64-page Book

2. GOOD PAY JOB

What will you be doing one year from today . . . will you be on your way toward a good job or a business of your own in Radio-Television? NRI Courses lead to these and many other jobs Radio and TV servicing, P.A., Auto Radio, Lab, Factory and Electronic Controls Technicians, Radio and TV Broadcasting, Police Ship and Airways Operators and Technicians. The United States has over 105 million home and auto Radios—over 2,900 Broadcasting Stations. Radio is growing, more expansion is on the way.

3. BRIGHT FUTURE

Think of the opportunitie in Television. It now reache from coast to coast with over 15,000,000 TV sets now in use; 10 TV stations operating. This means good pay jobs with brigh futures for operators, installation and service technicians. Now i the time to get ready for a successful future. My lessons cove both Radio and Television principles and equipment I furnish give you practice on circuits common to both Radio and Television

Television is Today's Good Job Maker

Over 1800 additional Television stations have been authorized with man expecting to be operating in 1953. That will cause the sale and servicin of sets to boom in areas where there is no television now. All this spell opportunity, good pay, progres if you act to prepare yourse **now.** Qualified Radio-Televisio technicians are making unusuall good money. Now the deman will increase; the field is growing

YOU LEARN BY PRACTICING *in* Spare Time WITH KITS I SEND

With both my Communications Course and my Servicing Course I send you many kits of parts you use to build equipment for practical experience. They "bring to life" my easy-to-understand, illustrated lessons. Shown here are just a few pieces of equipment you build. You use them to make many tests, experiment with circuits common to both Radio and Television. Read about and see photos of other equipment in my FREE 64-page Book. All equipment is yours to keep! Mail card now. No Postage Needed.

Find Out What Radio-Television Offers You

Keep your job while training a home. Hundreds I've trained ar successful Radio-Television technicians. Most had no previou experience, many no more tha grammar school education. Decide now that you are going t know more and earn more! Tak the important first step to a career and security.

MAIL CARD NOW!

Send the postage-free card no for my FREE DOUBLE OFFER You get Actual Servicing Lesson. Also my 64-page book, "Ho to Be a Success in Radio-Television." Read what my graduates are doing, earning; see equipment you practice with at home Mail card now. J. E. SMITH Pres., National Radio Inst., Washington 9, D. C. Our 39th year

The Tested Way to Better Pay

Get into . . .

PLASTIC LAMINATING AT HOME!

Sensational New

"ONE MAN BUSINESS"

. . pays $10 to $20 profit for each dollar of cost.

Make $20 to $30 a day by our MAGIC MAIL PLAN . . . get orders and cash from your mailman!

Here's the newest and most fascinating of all home-operated businesses. For the first time, a simplified machine brings the fabulous profits of Plastic Sealing and Plastic Laminating within the reach of the small operator. Can be operated in a corner of the kitchen, basement, or garage. And any man or woman, regardless of age, education, or experience—can learn this interesting work *in a few minutes of reading*—can turn out professional jobs *after one hour's practice.*

TWO EXCITING FIELDS FOR BIG PROFITS!

No house-to-house canvassing. No face-to-face selling. We not only supply the equipment you need for the work, but also show you exactly how to cash in big daily profits from two big demand fields.

A FORTUNE IN PLASTIC SEALING

Millions of people want to protect valuable cards, photographs, documents and papers against wear, soil, and damage. By our MAGIC MAIL Plan you get this business through the mails. Open envelopes and take out money and orders. Details of this plan will amaze you. It will be sent free. Just mail coupon.

ENORMOUS PROFITS IN LAMINATING

A creative, artistic business. Gift shops sell your entire output. Just a few of thousands of giftwares illustrated on this page. Beautiful colors. Endless designs. Exclusive "one of a kind" appeal brings sales at ten to twenty times the cost of materials. Beautiful illustrations and instructions for making these artistic novelties sent free.

Thousands of Beautiful Art Creations

No one yet has been able to list the thousands of gorgeous articles that can be made by Laminating as explained in our Free Information. Just a few of these objects are

COSTUME JEWELRY—CIGARETTE BOXES—JEWEL CASES—GLOVE AND HANDKERCHIEF BOXES—CUFF LINKS—NOVELTY BUTTONS—TRAY—CANDLESTICKS—COASTERS—CLOCK CASES—LAMP BASES PICTURE FRAMES—BOOK ENDS—PAPER KNIVES—KEY CHAIN CHARMS—CHECKERS—CHESSMEN—ADVERTISING SIGNS—NAMEPLATES—BOOKMARKS—BELT BUCKLES—TIE RACKS—KEEPSAKES OF ALL KINDS.

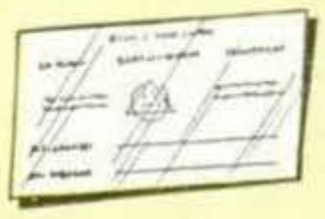
The opportunities in Plastic Laminating are so big that space here does not permit even skimming the surface. To get any idea

FREE at all of the size of these markets and your place in this sensational business you must read the details. See for yourself how easy it is to do the work—how you can put plastic sheets into your machine and take out a fortune—how money and orders come to you in the mail—how gift shops clamor to get more and more of your creations—how you can start with one machine and build up a big production plant with others doing the work—how you can get money and business from every State in the Union—how you can achieve independence without study or experience.

$5-$10-and $20 BILLS COME TO YOU IN THE MAIL

By our MAGIC MAIL Plan you sit at home, send out mail, and get back money and orders. Additional profits in supplying local people with lifetime protection for articles such as these:

SNAPSHOTS—IDENTIFICATION CARDS—DISCHARGE PAPERS—DRIVERS' LICENSES—SOCIAL SECURITY CARDS—VOTERS REG. CARDS—MENUS—BIRTH CERTIFICATES—CREDIT CARDS—BIRTH AND WEDDING ANNOUNCEMENTS—RAILROAD PASSES—IMPORTANT DOCUMENTS OF ALL KINDS.



Lifetime protection. See how laminating protects against wear, soiling, and moisture damage with its smooth, flexible, plastic covering on each side. LIFE-TIME PROTECTION needed for valuable or sentimental objects of all kinds—even a priceless whisp of hair can be laminated. Think of the countless thousands of profit items for your Laminating Press.

RUSH COUPON

FREE Never before has such an opportunity been offered the small, home-operator—an opportunity to gain complete personal independence in a big money business of your own. All information, fully illustrated with pictures, is free. Send the coupon—or send your name on a post card. There is no charge now, or at any other time. We may be limited in the number of Warner Laminators that can be made up, so don't put this off. Send for the information on this exciting opportunity today.

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1512 Jarvis Avenue, Chicago 26, Illinois

Rush complete information with illustrations showing the things I can make and the money possibilities in Plastic Laminating. All this is free. I do not pay a penny now or at any other time. No salesman is to call. Send all facts by prepaid mail. Be sure to tell me how I get orders and money from my Postman by your MAGIC MAIL Plan.

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